HISTORICAL PRESENCE OF CHINOOK SALMON AND STEELHEAD IN THE CALAVERAS RIVER

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Abstract

Interest is great for projects restoring steelhead (*Oncorhynchus mykiss*) and Chinook salmon (*Oncorhynchus tshawytscha*) to drainages where they have historically existed and where there is good quality habitat upstream of instream barriers. The Calaveras River has garnered renewed attention for its potential to support these anadromous fish. We evaluated migration opportunity in the Calaveras River, and whether these salmonids could have been present in the river historically, by comparing historical anecdotal and documented observations of Chinook salmon and steelhead to recorded flows in the river and Mormon Slough, the primary migration corridors. Collected data show these fish used the river before New Hogan Dam was constructed in 1964. Three different runs may have used the river including fall-, late-fall- and, spring-run salmon and steelhead before the construction of New Hogan Dam. Fall and possibly winter run and steelhead used the river after dam construction. The timing and amount of flows in the Calaveras River, both before and after the construction of New Hogan Dam, provided ample opportunity for salmonids to migrate up the river in the fall, winter and spring seasons when they were observed. Flows less than 100 cfs can attract fish into the lower river channel and this was likely the case in the past, as well. Even in dry years of the past, flows in the river exceeded 200 cfs, enough for fish to migrate and spawn. Today, instream barriers and river regulation, which reduced the number of high flow events, has led to fewer opportunities for salmon to enter the river and move upstream to spawning areas even though upstream spawning conditions are still adequate.

Acknowledgements

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Table of Contents

List of Figures

List of Tables

Introduction

The Calaveras River has garnered renewed attention for its potential to support anadromous fish such as steelhead (*Oncorhynchus mykiss*) and Chinook salmon (*Oncorhynchus tshawytscha*). Interest is great for projects restoring these fish to drainages where they have historically existed and where there is good quality habitat upstream of instream barriers. The Calaveras River has the potential for supporting anadromous fish based on habitat qualities such as geomorphology (22 feet per mile gradient, numerous riffles and pools), adequate spawning gravels, and a dense riparian canopy (USFWS 1993, CALFED Bay-Delta Program 2000). Streamflow is the principal factor currently limiting salmonids in the river (CALFED Bay-Delta Program 2000). Regular surveys of adult escapement or spawning had not been conducted in the Calaveras River until recent United States Fish and Wildlife Service (USFWS) surveys through the Anadromous Fish Restoration Program (AFRP). Historical documentation prior to 1970 of the presence of Chinook salmon in the Calaveras river is limited. Comprehensive fish survey data were not collected regularly in California until the 1940s. Knowledge of salmon and other anadromous fish distributions in the Central Valley during earlier times relies largely on non-scientific historical writings (Yoshiyama et al. 2000). Since the 1950s nearly half of Central Valley streams that historically supported salmon runs have lost at least one seasonal salmon run and several major streams have had all their salmon runs extirpated (Yoshiyama et al. 2000). Comparing observations of salmon and steelhead in the Calaveras River with San Joaquin River Basin salmonid life history, salmonid presence in adjacent drainages, and seasonal availability of flows and channel migration conditions is one way to evaluate whether adult salmon and steelhead could have historically been present in the Calaveras River.

The watershed of the Calaveras River is about 400 square miles with headwater elevations of about 5,000 feet (Figure 1). Anadromous fish have access to 36 miles of the river between New Hogan Dam and the San Joaquin River when flows permit. Upstream of New Hogan Dam, the upper watershed is mixed conifer forest, and the foothill reach is bordered by oak-foothill pine woodland, oak woodland, chaparral, and annual grassland. Downstream of New Hogan Dam there is a dense riparian corridor bordering the river along the 18 miles down to Bellota Weir (USFWS 1998). In the Central Valley reach, there are orchards, agricultural fields, or overgrown riparian vegetation adjacent to the stream channel. Near its confluence with the San Joaquin River, the Calaveras River is bordered on both banks by the city of Stockton, passing through housing subdivisions, the University of the Pacific campus, and parks (USFWS 1998). Eighteen river miles (RM) upstream of the river mouth, Bellota Weir splits the river into two channels, Mormon Slough and the old Calaveras River channel. Mormon Slough and the Stockton Diverting canal downstream are the primary channels used by migrating anadromous fish to access upstream spawning areas in the mainstem Calaveras River upstream of Bellota Weir (Figure 2). Levees along Mormon Slough and the Stockton Diverting Canal are covered with sparse grass or shrubs, and adjacent to the old Calaveras River channel are orchards or light industry.

The Calaveras River hydrologic record, before river regulation, shows higher flow in winter and spring and periods of low to no flow in late summer and fall. After regulation by New Hogan Reservoir in 1964, winter and spring flow peaks have been lower and water now flows year-round between New Hogan Dam and Bellota Weir. Seasonal flows in the old channel and

Mormon Slough have not been reliably documented. However, historical descriptions of Mormon Slough indicated higher flow in winter and spring, and periods of low to no flow in late summer and fall. Heavy rains brought flows to the old channel. Additionally, during heavy rains, various natural channels in the vicinity will overflow into the old Channel. It likely also dried out during summer and fall. Currently, flows are controlled by Bellota Weir into Mormon Slough and by the Calaveras Head Works into the old channel. Fall flows in Mormon Slough, following the end of the irrigation season, frequently drop to levels less than 20 to 30 cubic feet per second (cfs) and may prevent spawning migration (FFC 2004). Currently, the old channel is watered during the irrigation season and controlled by a series of flashboard dams in the channel. Once the irrigation season ends, the channel is dry unless heavy fall and winter rains cause surface runoff to flow into the channel. Mormon Slough, the primary migration channel, still experiences dry periods in summer and early fall as it did under the pre-1964 unregulated hydrologic regime. Today the channel is filled with irrigation water until around mid-October, when irrigation season ends, and, then many channel segments go dry through the winter except during storms when runoff and high flows enter the channel or overtop Bellota Weir. Otherwise, all flow coming from New Hogan Dam is diverted at the weir into a mostly unscreened water treatment plant. Once flows recede, the channel goes dry except for disconnected pools where salmon become stranded.

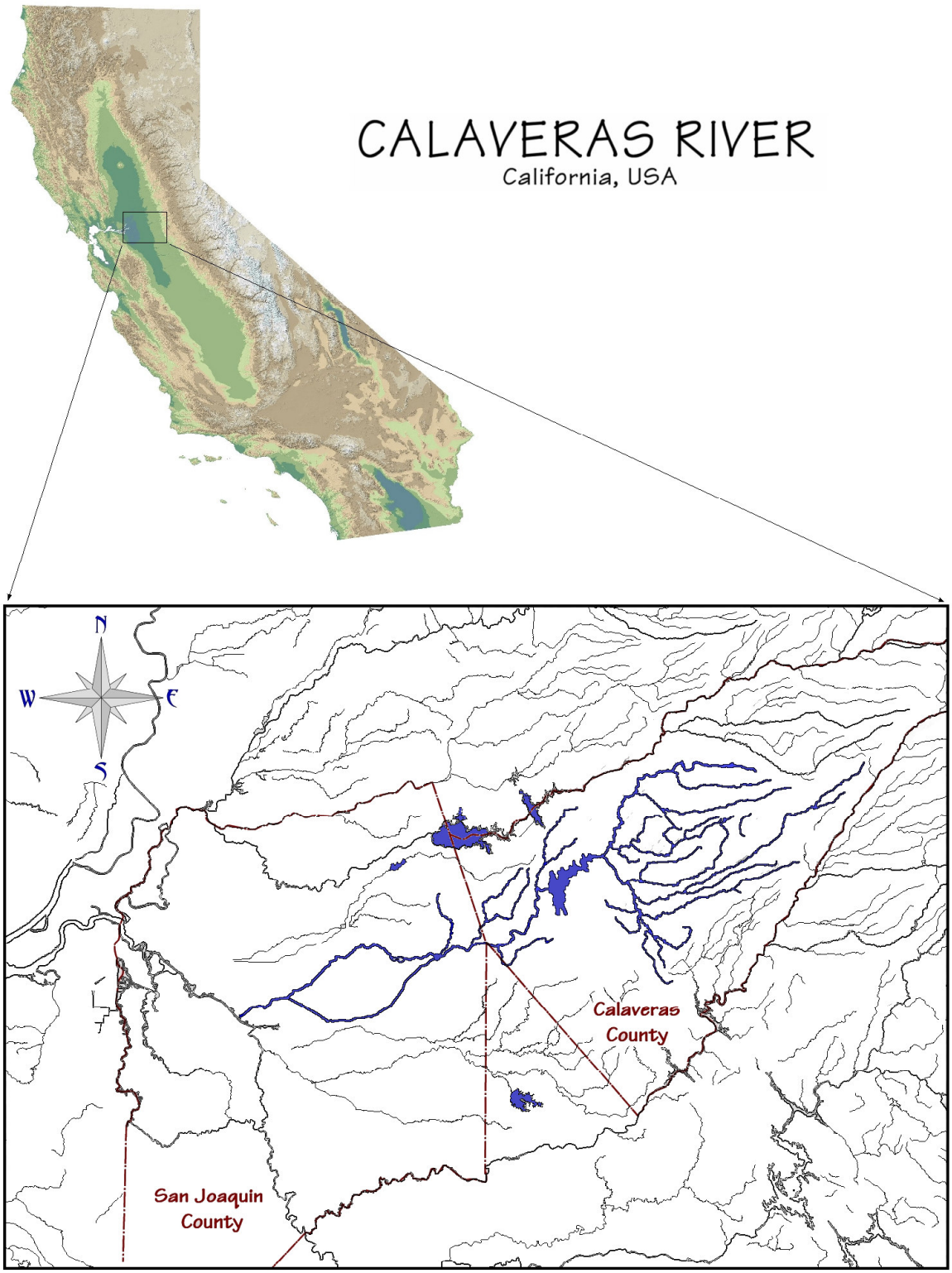


Figure 1. Location of Calaveras River and watershed.

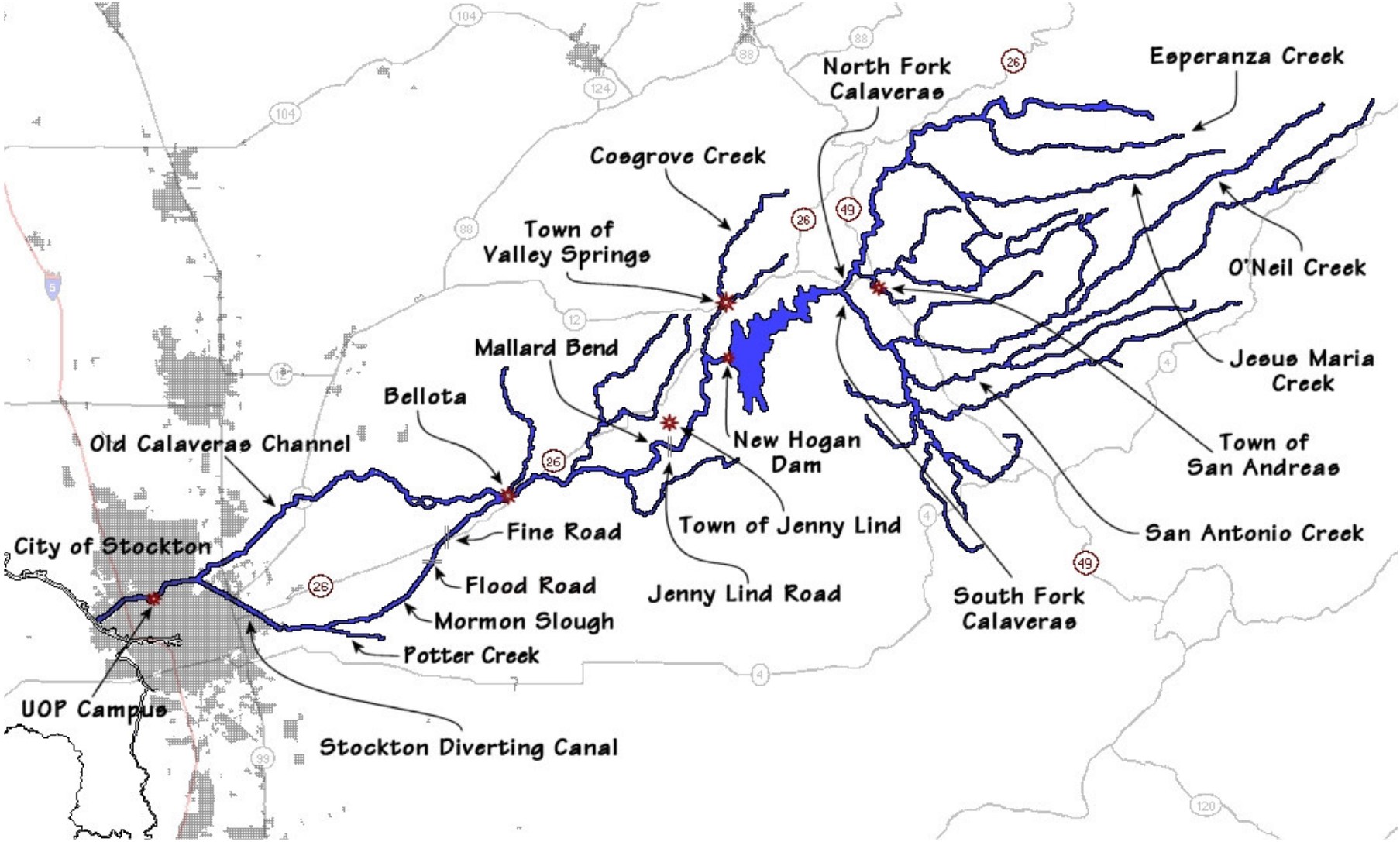


Figure 2. Map of the Calaveras River and major tributaries showing the location of significant barriers and features.

Basin Hydrology

The watershed is at elevations below the typical snow level and thus, the primary water source is rainfall. Precipitation usually occurs as rain below 4,000 feet. Above 4,000 feet, precipitation may occur as snow, although winter storms often bring rain above 4,000 feet (CCWD 2002). Flooding in the watershed can occur from November through April. Rain is generally moderate but can be prolonged over several days causing floods that are characterized by high, but short, peak flows. When antecedent rainfall saturates the ground or when the ground freezes, the runoff is much greater and flooding more severe (CCWD 2002). Approximately 93 percent of all runoff occurs between November and April (USFWS 1998). For the period of 1907-1980, the mean annual runoff was about 157,000 acre-feet (USFWS 1993). The next adjacent watershed to the north, the Mokelumne River watershed, is fed primarily by spring-runoff from snowmelt, but also receives water during winter and spring storms. The average annual runoff in the Mokelumne River is 378,700 acre-feet. The Stanislaus River watershed to the south receives runoff from spring snowmelt and from rainfall. The average annual runoff in the Stanislaus River is 699,800 acre-feet (USFWS 1998). Normal annual precipitation for the watershed upstream of New Hogan Dam is 33.3 inches and ranges from about 24 inches at New Hogan Dam to nearly 50 inches in the upper basin. Normal annual precipitation for the lower watershed is 14.2 inches in Stockton, 17.5 inches at Bellota, and 18.9 inches at Jenny Lind (Figure 2).

A variety of historical accounts describe the early conditions of the Calaveras River. Tinkham (1880) describes the river as continually overflowing its banks during spring-run-off.. Similarly, Mormon, Lindsey, and Fremont Sloughs frequently flooded, forming a branch known as the Stockton Slough, which flowed for three miles to the San Joaquin River. These stream channels, as well as others, created a network of watercourses. According to Tinkham (1880), “As the soil is soft the branches of the large streams cut branches in every direction.” There is strong evidence that the valley reach of the Calaveras River was a large floodplain with many braided streams during times of high water. Tinkham (1880) also states that, “when the high waters of the rivers subside, the waters of the slough, except near their outlets, become stagnant, and in a few weeks their beds become dry and hard.”

The Calaveras River area has changed from an uncontrolled floodplain of sloughs and oak groves of the 1860s to today’s system of controlled channels, dams, and levees. Beginning in the late 1890s farmers in the Linden area were the first to divert water from the Calaveras (Smith 1976). In 1929, the Linden Irrigation District received the rights to store 16,000 acre-feet of water behind Hogan Dam, the first impoundment on the river for flood control. The city of Stockton built in Hogan Dam in 1930 near Valley Springs, about seven miles upstream of Jenny Lind (Figure 2). The dam’s original capacity was 1,000 acre-feet, and it was probably drained almost entirely by the end of each summer (DFG 1963). In 1933, the District built the Calaveras Head Works at Bellota. In 1936, the Linden Irrigation District became concerned that Hogan Dam was holding back too much water, preventing the usual flows down the Calaveras River, Mormon Slough, and North Channel. They proposed building dam gates so that they could store flood water and release it later for irrigation (Anonymous 1936). The city retrofitted the dam by installing outlet controls in 1950, and afterwards the dam could store 76,000 acre-feet and it was possible to regulate outflow and maintain flows in some years for part of the summer, but still there were dry periods (USFWS 1993). The Stockton East San Joaquin Water Conservation

District took over the operation of the Calaveras Head Works in 1948 and built Bellota Weir in Mormon Slough in the late 1940s.

As a result of more farming and the need for greater flood control and replenishment of groundwater, the Army Corps of Engineers began building New Hogan Dam in 1960. This rock and earth fill structure, completed in 1964, created a 4,410-acre reservoir with a capacity of 325,000 acre-feet, just over twice the watershed's mean annual runoff. The reservoir supplied water to the Stockton East San Joaquin Water Conservation District. Because of the large capacity of New Hogan Reservoir relative to the average annual inflow, spills occur only in wet years. New Hogan Reservoir substantially altered the timing, magnitude and duration of flows in the river. In 1971, the Conservation District was renamed Stockton East Water District (SEWD) Also in 1971 SEWD constructed seven additional flashboard dams in Mormon Slough to provide surface water, and reduce use of overdrawn groundwater. In 1978, SEWD began operating a maximum 65-cfs water diversion at Bellota Weir for a water treatment plant. The former intermittent seasonal flow was replaced with a steady year-round flow delivering water from New Hogan Dam to the plant's diversion at Bellota. SEWD's irrigation and municipal-industrial diversions include the Calaveras River Head Works, Bellota Weir, and a 65 cfs municipal-industrial unscreened water intake built in 1978 at Bellota Weir.

In addition to New Hogan Dam, there are seven additional dams in the Calaveras River watershed upstream of New Hogan Dam. New Hogan Dam can hold 325,000 acre-feet or about 200 percent of the mean annual runoff of 157,000 acre-feet. The seven other dams can hold about 1,580 acre-feet, or about 1 percent of the mean annual runoff (Table 1).

Table 1. Reservoirs of Upper Calaveras River Basin (Source: Calaveras County Water District)

Reservoir Name	Storage Volume. (AF)	Tributary	Owner
New Hogan Dam	325,000	Calaveras River	Corps of Engineers
White Pines Lake	262	San Antonio Creek	CCWD
Ross Reservoir[1]	100	French Gulch Creek	Utica Power Authority
Redhawk[2]	400	N. For. Calaveras	Calaveras Public Utility District
Spence Ranch	600	Cherokee Creek	Private (Spence Family)
Emery[3]	≈100	Murray / El Dorado Creeks	Private (M24 Ranch Assoc.)
Lakemont Pines HOA	124	Tributary to San Antonio	Private (Lakemont Pines HOA)
Steele Creek	95	Steele Creek / S Fork Calaveras	Private (Sainte Partners LP)
Total	1,581		

1. Reservoir appears to have a fairly limited natural drainage. Although it is located within the Calaveras watershed, most of the inflow is from the Angels / Utica Project on the Stanislaus River. Storage volume is excluded from total. Water from Ross is released to Angels Camp for consumptive purposes, Dogtown Ditch for irrigation and to Angels Powerhouse. Angels Powerhouse outflow returns to the Stanislaus.
2. Reservoir has also been known as Calaveras, McCarty, Rich Gulch, or Bingham Reservoir.
3. From USGS topo, appears to be at least 100 AF in size and located in a relatively small bowl-shaped area.

The San Joaquin Valley portion of the river historically had low or no flows in late summer and early fall. However, deep pools in the six-mile reach from New Hogan Dam to the town of Jenny Lind provide suitable summer holding areas for salmon and resident trout in all but the driest years (CALFED Bay-Delta Program 2000). According to the California Department of Fish and Game (DFG 1963), zero flows or flows less than one cubic foot per second were "common in the late summer and fall months downstream of Hogan Dam. During most years, several days or even months of no flow can be expected in this reach starting in July and continuing through

November." Also, the reach from former Hogan Dam to Jenny Lind, confined to a relatively deep canyon, has deep pools that are maintained through the dry season even though there is no flow in the river (Figure 2).

Tributary streams likely had water temperatures and habitat suitable for cold and warm water fish, even during the summer months. Unspecified warm water fish persisted upstream of Hogan reservoir in isolated pools throughout the year (DFG 1963). Trout fishing records in Calaveras County indicate major tributaries had permanent flows from cold springs at the 1,200-2,000 feet elevation that supplied sufficient cold water to support self-sustaining populations of German brown trout and rainbow trout (DFG 1963). Summer flows on Esperanza Creek resulted from springs occurring in the canyon downstream of Railroad Flat-Sheep Ranch Road. A United States Geological Survey (USGS) gauging station on Esperanza Creek (1952-1959), a tributary upstream of New Hogan Dam, recorded minimum flows of 0.1 cfs to a maximum of 3,000 cfs with an average of 14.5 cfs. USGS quadrangle maps show Double Springs draining into Cosgrove Creek, a tributary downstream of New Hogan Reservoir, and unnamed springs scattered in the upper drainage, as well. During high stream flows in spring, trout redistributed themselves both upstream and downstream in the tributary streams making trout fishing possible during late spring in sections of the streams that dry up in June or July (DFG 1963).

Other tributaries upstream of New Hogan Dam perrenial flows. DFG (1963) notes that O'Neil Creek had permanent flow during normal and wet years at a proposed reservoir site near Sheep Ranch. San Antonio Creek has higher permanent flows than the other tributaries, and Jesus Maria Creek has flows similar to O'Neil Creek. In addition, DFG (1963) goes on to state:

> Above Hogan reservoir, all streams in the Calaveras River drainage are dry in late summer where they cross Highway 49. However, two tributaries, the North Fork Calaveras River and San Antonio Creek, had perennial flows at the Railroad Flat-Sheep Ranch Road crossing in 1961. Records in California Department of Fish and Game (DFG) survey files indicate that perennial flows occurred in Jesus Maria and O'Neil Creeks in the vicinity of the Railroad Flat-Sheep Ranch Road prior to the present dry cycle.

Lindley et al. (2006) modeled historical distribution of summer rearing habitat for anadromous *O. mykiss* and included several Calaveras River tributaries upstream of New Hogan Dam, San Antonio, San Domingo, O'Neil, and McKinney Creeks. They also propose an historical independent population of steelhead for these creeks and for the mainstem Calaveras River.

Cosgrove Creek remains unregulated and contributes flow to the Calaveras River during winter and spring months. Average monthly flow from November to April for the period of record (1929-1969) is 2 to 29 cfs and from May to October is zero to 0.6 cfs. S.P. Cramer and Associates (SPC) reports that flows over 100 cfs at Cosgrove Creek can result in increased flows at Shelton Road and Bellota (Calaveras River Watershed Stewardship Group 2005). In addition, a peak flow event of 1,406 cfs measured at the Mormon Slough gauge is attributed to inputs from Cosgrove Creek, not increased releases from New Hogan Reservoir (Calaveras River Watershed Stewardship Group 2005).

Stream flow on the Calaveras River has been measured at several locations since 1907. The longest record is from the USGS gauge located at Jenny Lind from 1907-1966. After completion of New Hogan Dam, the gauge was discontinued and a new one was established by the U.S. Army Corps of Engineers (USACE) at New Hogan Dam Road bridge, less than 1 mile downstream of the dam. The New Hogan Dam gauge recorded flows from 1964 to the present. Table 2 lists all gauges and their period of record in the Calaveras River from New Hogan Dam and downstream.

Table 2. Gauges on the Calaveras River.

Gauge Name[1]	Number	Period of record
Jenny Lind	USGS 11309500	1907-1966
Calaveras River downstream of New Hogan Dam near Valley Springs	USGS 11308900	1961-1992
New Hogan Dam	USACE NHG	1964-present
Mormon Slough at Bellota	USACE MRS	1989-present [2]

1. Other gauges were once operated by the DWR, but the data is considered inaccurate or unusable. Calaveras River near Stockton gauge (B02520, 11310500 (USGS), 1925 - 1975; 1985, respectively) was relocated along the old Calaveras River channel several times. Flows in the channel were controlled and all but flood flows by-passed the channel. Stockton Diverting Canal at Stockton (B02580, 11311000 (USGS), 1925 - 1975; 1985, respectively) may have been tidally influenced and was relocated several times. Over the course of time, the Calaveras River at Stockton gauge was the same as the Stockton Diverting Canal at Stockton gauge. Mormon Slough at Bellota (B02560, 1948-1975) and Calaveras River at Bellota (B02555, 1949-1966), are considered inaccurate due to influence of fluctuating pool behind Bellota weir during irrigation season (R. Johannet, USACE, Sacramento, CA).
2. Only data from 1997 on is considered useable due to prior years' operational problems. (R. Johannet, USACE, Sacramento, CA)

The mean of monthly streamflow for the Jenny Lind gauge (1907 to 1963) ranges from 6.4 cfs to 770.6 cfs. Peak streamflow for the same period ranged from 405 cfs on February 15, 1931, a drought year, to 50,000 cfs on January 31, 1911, the wettest year on record. Annual mean stream flow in 1911 was 749 cfs. The driest year was 1961 with annual mean streamflow of 16 cfs. Maximum annual runoff was 500,000 acre-feet in 1911 and minimum annual runoff was 12,300 acre-feet in 1961 (USFWS 1993). In contrast, the driest year after the river was regulated by New Hogan Dam was 1977 with an annual mean streamflow of 81.8 cfs. The dam significantly reduced floods on the river. The largest daily mean flow was over 31,000 cfs before the dam and less than 8,000 cfs after its construction.

Mean of monthly streamflow shows a difference in summer and early fall streamflow patterns before and after construction of New Hogan Dam (Figure 3). The Jenny Lind gauge was used to illustrate pre-dam flow conditions. This period may not fully reflect natural hydrologic conditions because the storage of Hogan Dam, built in 1930, was increased in 1950. Under pre-dam conditions the months of highest flows were typically January through April, and the months of lowest flows were September to mid-November. The New Hogan Dam gauge was used to illustrate post-dam construction flow conditions. Under post-dam conditions summer flows increase as water is released for irrigation, and winter and early spring flows are of much less magnitude due to control of water released from the reservoir. Mean of monthly flows for dry and wet water years have similar rainfall-induced peaks in winter and early spring in both pre- and post- New Hogan Dam periods. They differ in that summer and early fall flows are elevated after flow regulation began (Figures 4 and 5).

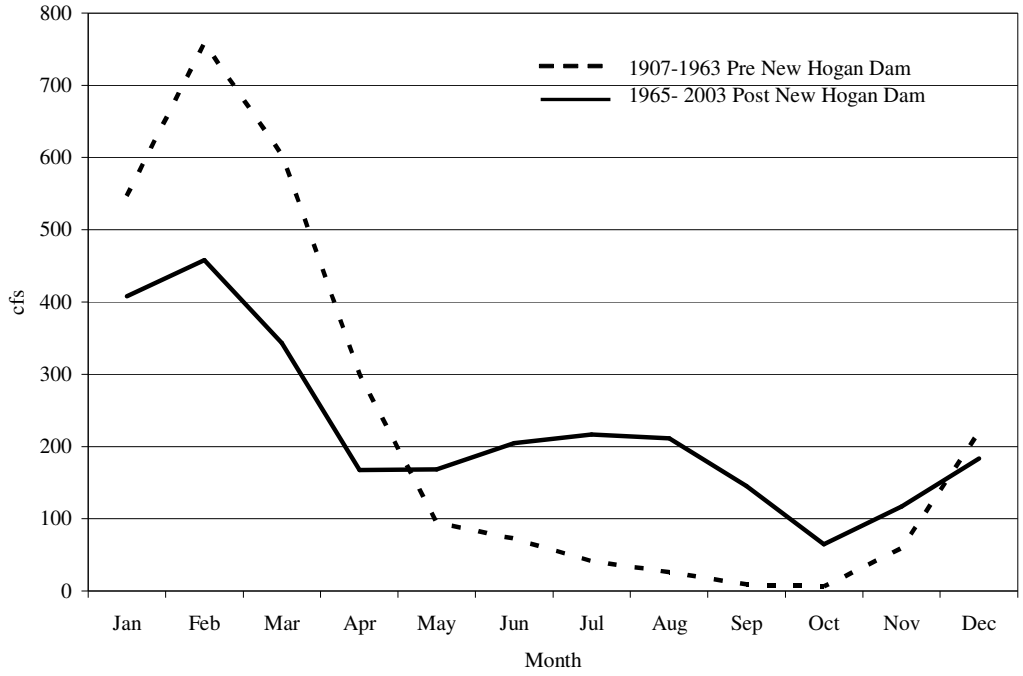


Figure 3. Pre- and post-New Hogan Dam mean of monthly streamflow based on daily average streamflow data. USGS Jenny Lind, 1907-1963, data from USGS. New Hogan Dam, 1965-2003, data from USACE.

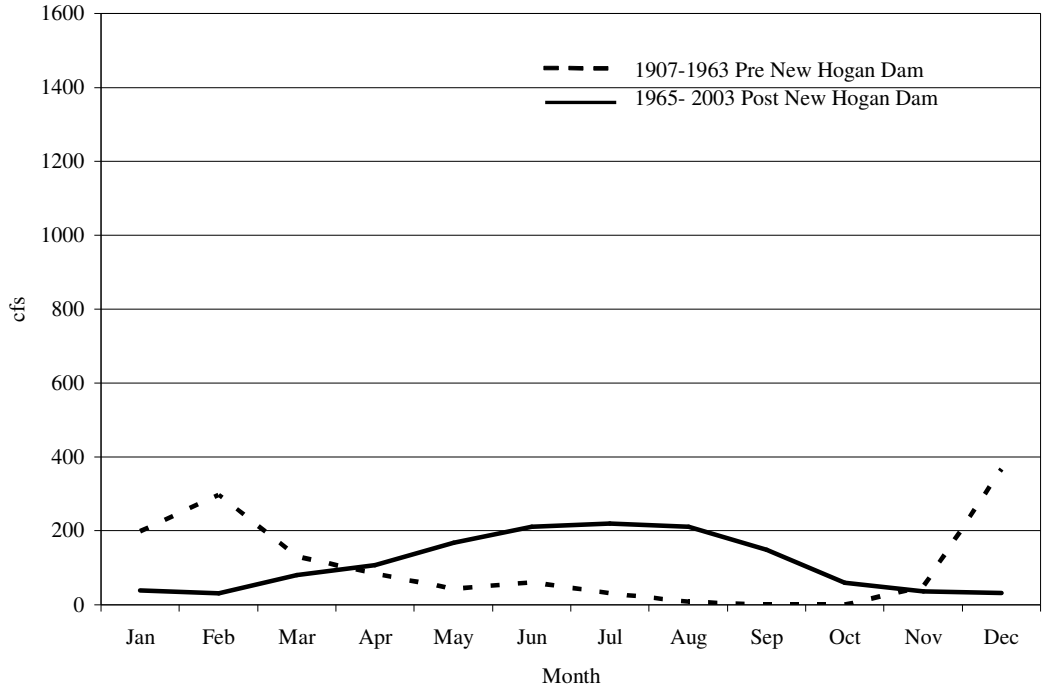


Figure 4. Pre- and post-New Hogan Dam mean of monthly streamflow for dry water years for period 1907 - 2003. Based on daily average streamflow data. USACE New Hogan Dam (1965-2003) and USGS Jenny Lind (1907-1963).

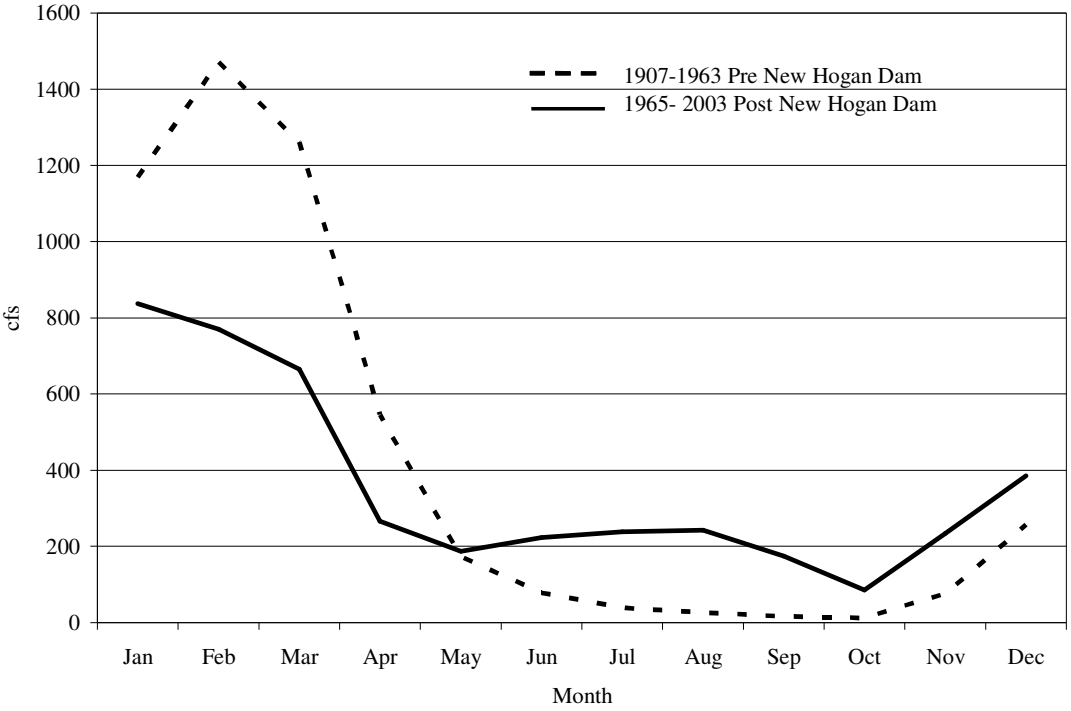


Figure 3. Pre- and post-New Hogan Dam mean of monthly streamflow for wet water years for period 1907 - 2003. Based on daily average streamflow data. USACE New Hogan Dam (1965-2003) and USGS Jenny Lind (1907-1963).

During dry years between 1907 and 1950 there were about two to three months each year with monthly mean streamflow less than 15 cfs at Jenny Lind (typically August and September). After 1950, when Hogan Dam was retrofitted to store water, some ability was gained to provide summer flows for irrigation and there were fewer summer months with monthly mean streamflow less than 15 cfs, although not in every year. Once New Hogan Dam was built, there have been no months in which monthly mean streamflow was less than 15 cfs at New Hogan Dam gauge except in 1977, the driest year on record. In general, instream flow releases during the irrigation season (April - October) range from 150 to 250 cfs (DFG 1993).

The number years classified as wet or dry is the same in the pre- and post-dam regulation periods. However, after river regulation the number of peak flows over 100 cfs drops dramatically in dry years from 30 to 9 events , potentially reducing migration opportunities for salmonids in drier years (Table 3). Table 4 provides water-year type designations from DWR's Chronological Sacramento and San Joaquin Valley Water Year Hydrologic Classification Indices (http://cdec.water.ca.gov/cgi-progs/iodir/wsihist).

Table 3. Number of monthly peak flows over 100 cfs during potential Chinook salmon migration period (November to April) in dry and wet years. Period of record for Jenny Lind (1907-1963) and New Hogan Dam (1964-2002) gauges.

Gauge (Period of Record)	# of Dry Years in Period of Record	# of Wet Years in Period of Record	Dry Years # of Monthly Peak Flows >100 cfs November-April	Wet Years # of Monthly Peak Flows >100 cfs November-April
Jenny Lind (1907-1963)	7	15	30	76
New Hogan Dam (1964-2002)	7	15	9	61

Table 4. San Joaquin Valley Basin water-year types for years 1907-2003. Source: Department of Water Resources Chronological Sacramento and San Joaquin Valley Water Year Hydrologic Classification Indices W – wet, AN – above normal, BN – below normal, D – dry, C – critically dry. (http://cdec.water.ca.gov/cgi-progs/iodir/wsihist)

Year	Year Type	Year	Year Type	Year	Year Type
1907	W	1940	AN	1973	AN
1908	D	1941	W	1974	W
1909	W	1942	W	1975	W
1910	AN	1943	W	1976	C
1911	W	1944	BN	1977	C
1912	BN	1945	AN	1978	W
1913	C	1946	AN	1979	AN
1914	W	1947	D	1980	W
1915	W	1948	BN	1981	D
1916	W	1949	BN	1982	W
1917	W	1950	BN	1983	W
1918	BN	1951	AN	1984	AN
1919	BN	1952	W	1985	D
1920	BN	1953	BN	1986	W
1921	AN	1954	BN	1987	C
1922	W	1955	D	1988	C
1923	AN	1956	W	1989	C
1924	C	1957	BN	1990	C
1925	BN	1958	W	1991	C
1926	D	1959	D	1992	C
1927	AN	1960	C	1993	W
1928	BN	1961	C	1994	C
1929	C	1962	BN	1995	W
1930	C	1963	AN	1996	W
1931	C	1964	D	1997	W
1932	AN	1965	W	1998	W
1933	D	1966	BN	1999	AN
1934	C	1967	W	2000	AN
1935	AN	1968	D	2001	D
1936	AN	1969	W	2002	D
1937	W	1970	AN	2003	BN
1938	W	1971	BN	2004	D
1939	D	1972	D	2005	W

Chinook Salmon and Steelhead Life History

In addition to hydrology, salmonid life history of the San Joaquin River Basin provides an important point of reference for the potential timing of migration and spawning of salmonids in the Calaveras River.

Fall-run Chinook

Baker and Morhardt (2001) described a generalized life history for Chinook salmon in the San Joaquin River and major tributaries, stating that the spawning run typically extends from October through December, with the bulk of the run appearing in the tributaries in November. Spawners are occasionally seen in September and are frequently reported in small numbers in January. They begin to construct redds and spawn as soon as they arrive in the spawning reaches of the tributaries. The young fish emerge from the streambed from late December through April, with most emerging in February. Most fry remain in the tributaries until spring, when they undergo smoltification, a set of physiological changes preparing them for ocean life, and begin their seaward migration. The smolt emigration peaks in April and May, but can extend from late February through June. Some fry do not join the spring emigration, but instead remain in the tributaries over the summer, emigrating in October and November as yearlings (Baker and Morhardt 2001). According to Yoshiyama et al. (1998) fall-run of the Tuolumne River migrate from October to early January. S.P. Cramer and Associates documented Chinook salmon migrating up the Stanislaus River in 2003 as early as September 19, and in 2004 as early as Sept 27. In the Sacramento River Basin, this period is one to two months earlier.

Late-fall run Chinook

Life history timing for late-fall run in the San Joaquin River Basin is not well documented. However, SPC documented migrating adult female Chinook salmon in the Stanislaus River as late as February 14, 2004 during their first year of monitoring. According to DFG (1993) late-fall run Chinook migrate into the San Joaquin River Basin tributaries from mid-October through mid-April. The fish spawn from January through mid-April and egg incubation occurs from January through June. Rearing and emigration of fry and smolts occurs from April through mid-October. Significant emigration of naturally produced juveniles occurs through November and December and possibly into January. Migration and spawning timing in the Sacramento River Basin is similar for late-fall run, with migration during October – April, peak migration in December, and spawning from early January to April, and peak spawning in February through March (Yoshiyama et al. 1998).

Spring-run Chinook

Neither the life-history nor migration period of spring-run on the San Joaquin River is well documented. Generally, spring-run salmon enter rivers during high water of spring runoff and remain until the spawning season the next fall. Unlike fall run, spring-run Chinook can wait several months in fresh water before spawning. In the San Joaquin drainage, the upper San Joaquin River supported what may have been the largest population of spring-run salmon in the state until 1947. The Merced River spring run had disappeared by 1929 (Skinner 1958). Water development drastically reduced San Joaquin runs long before major losses occurred on the Sacramento River. In 1948 Friant Dam was completed, cutting off access to historical spring-run spawning and summer holding habitat in the upper San Joaquin River itself. According to DFG San Joaquin River data provided by retired DFG biologist Dan Odenweller, the San Joaquin River spring run escapement in 1945 was 56,000, dropping to 2,000 in 1948, the final year of

data. According to Skinner (1958) there has not been a successful spawn of Chinook salmon in the San Joaquin River since spring of 1946. According to Warner (1991) 1950 was the last run of spring-run up the San Joaquin River. However, from June 20 to August 11, 2000 the FFC documented spring-run, originating from the Feather River hatchery in the Sacramento River system, in the Stanislaus River in the deeper pools of Goodwin Canyon as well as in deep pools between Knights Ferry and Orange Blossom (FFC 2002). Sacramento River Basin spring-run migrate from March-September with the spawning period in late August-October. It is not known whether this is earlier, later or similar to spring run migration and spawning timing in the San Joquin River Basin.

Winter-run Chinook

Winter-run salmon of the Sacramento River Basin migrate from December to July, and spawn from late April to early August. Juvenile winter run emerge from July - October and can spend up to 10 months in freshwater (Yoshiyama et al. 1998). This period corresponds to observations of the so-called winter run in the Calaveras River in the 1970s and 1980s. In 1975, fish were observed by DFG biologists migrating as early as January and spawning in April to July or holding in pools downstream of New Hogan Dam in June. Low autumn flows in some years apparently caused juveniles to hold over and migrate out as yearlings (USFWS 1993). DFG documented Chinook salmon yearlings in 1974, 1977, and 1987 in February through June. Interestingly, in June 2000 FFC biologists documented what they believe were small numbers of stray winter-run adult salmon in the Stanislaus River that were in poor condition and had already spawned. Yearling Chinook were also observed in low numbers over summering in the river upstream of Lovers Leap in the Stanislaus River (FFC 2002).

Steelhead

Steelhead are the anadromous life history form of rainbow trout, *Oncorhynchus mykiss*. Steelhead are broadly characterized into winter- and summer-runs (FFC 2004). Only winter steelhead are believed to have occurred in the San Joaquin River Basin. Winter run enter spawning streams in fall or winter, and spawn a few months later in winter or late spring (Meehan and Bjornn 1991, Behnke 1992 as cited in FFC 2004). However, no information on the run timing or life history of steelhead that occurred in the San Joaquin River Basin is available apart from observations in October and November 1940 and October 1942 in the Tuolumne River (CDFG unpublished as cited in FFC 2004). Documentation of early steelhead observations is scarce.

Adjacent Drainages

The documented historical presence of anadroumous fish in the San Joaquin River and in San Joaquin River Basin drainages adjacent to the Calaveras River supports the historical presence of Chinook salmon and steelhead in the Calaveras River.

Cosumnes River

The Cosumnes River is a tributary to the Mokelumne River and its watershed is similar in size (550 square-miles) and elevation (4,300 feet elevation) to the Calaveras River. Like the Calaveras its headwaters are lower than the average snow level, the river is almost exclusively fed by rainfall during winter and spring rains. The elevational and hydrologic settings of the Cosumnes and Calaveras Rivers are similar, so a more detailed description of the Cosumnes hydrology is worthwhile. Average annual precipitation ranges from 15 inches near the mouth of the river to 50-60 inches in the upper watershed, averaging about 33 inches overall. Most of the

flow in the river and its tributaries results from winter rain, and the annual hydrograph closely follows the pattern of precipitation. Snow accumulation and melt provides only a minor contribution to annual runoff because the area of snow cover is usually less than 16% of the watershed. The annual hydrograph is characterized by a high-water period during winter rains followed by a low-flow period during the dry summer months, similar to that of the Calaveras River. Floods in the river usually result from intense rainfall, are generally very flashy, and typically last for only a few days (Jones and Stokes 2003). According to Yoshiyama et al. (2001) the river has been an intermittent stream and from earliest times offered limited access to salmon. However, Mount et al. (2001) suggested excessive pumping of groundwater may have caused the disconnection between the lower Cosumnes and its aquifer, which in turn has substantially reduced the hydrological connectivity of the river. Prior to 1920, the groundwater table was thought to be near the ground surface along the lower river (Bertoldi et al. 1991), potentially allowing flow throughout the year. The river now loses flow through its streambed downstream of Highway 16, resulting in increased number of extreme low-flow days in summer and, consequently, the bed of the lower Cosumnes River is often dry in the late summer and fall (Jones and Stokes 2003). Average flow in the Cosumnes River for the period 1907 to 2003 was 498 cfs. Eighty-five percent of the time mean daily flows are below 1,000 cfs (313 days in a year, on average). Flows exceed 2,000 cfs 4.9 percent of the time (18 days per year) and exceed 5,000 cfs 1 percent of time (4 days per year) (Jones and Stokes 2003). Similarly, mean daily flows on the Calaveras River are below 1,000 cfs 95 percent of the time (on average 346 days in a year), and exceed 2,000 cfs 2.38 percent of the time (8.7 days per year) and exceed 5,000 cfs 0.6 percent of the tim (e2.26 days per year).

About 41 miles of river are accessible to anadromous fish. Only a fall run is definitely known to have occurred. However, the presence of rainbow trout suggests that steelhead may have existed also in this river (FFC 2004). Salmon generally cannot ascend the Cosumnes River until late October to November, when adequate flows from rainfall occur (DFG 1993) because the lower river may be dry in some areas before the first storm runoff. Early migration often is precluded by lack of water in the river. Adults are stranded in shallow areas in low-flow conditions. In years of low rainfall, salmon do not successfully migrate to suitable spawning areas upstream (USFWS 1998). According to the U.S. Bureau of Reclamation (USBR) the average size of the Cosumnes fall run for the period 1953-1989 was 1,300 fish (USBR 2000). Clark (1929) reported the presence of “a considerable run” which he stated to be equal to that in the Mokelumne River. Presently, spawning grounds extend from the river mouth upstream of tidewater to an irrigation diversion dam near the town of Sloughhouse, a barrier to salmon. In 1939 the spawning grounds extended along the 15.2-mile stretch from Sloughhouse Bridge to the falls downstream of Latrobe Highway Bridge (Hatton 1940).

Mokelumne River

The Mokelumne River watershed is larger (661 square miles) and has higher headwaters greater than 10,000 feet elevation) than the Calaveras River, as well. Today, 46 miles are accessible to anadromous fish. The river is fed primarily by spring snowmelt, but also rainfall during winter and spring storms. Today, fall-run Chinook salmon and steelhead occur in the lower Mokelumne River (USFWS 1998). Historically, the river supported fall- and spring-run Chinook salmon, and Yoshiyama et al. (2001) suggest that a late-fall run also occurred. Spring-run salmon were eliminated when Pardee Dam was completed in 1928, blocking access to the upper watershed. The few spring-run that may have remained were extirpated with completion of Camanche

Reservoir in 1963. Steelhead historically had substantial annual runs in the Mokelumne River. The native steelhead run in this river system is extinct (USFWS 1998). Today, steelhead are maintained in the river by hatchery plants. According to USFWS biologist Gonzalo Castillo the number of naturally spawning and hatchery spawning steelhead is fewer than 100 per year.

The earliest historical references to salmon seem to indicate that late-fall run salmon actually occurred in the Mokelumne River at least until the mid-1800s. Historical journal accounts from the late 1820s trapping period and the 1849 Gold Rush describe purchases of salmon in "fine" condition on January 22, 1828 (Sullivan 1934) and December 22, 1851 (Clark 1973). Yoshiyama et al. (2001) suggest these were likely late-fall run or perhaps spring-run, noting that the timing seemed extraordinarily early for spring-run. The December 1851 date is consistent with peak migration time of the late-fall run, and although fall run stragglers cannot be discounted, it is somewhat more likely that late-fall-run fish would have been present in a physical condition that could be described as "fine." Salmon ascended the river at least as far as the vicinity of Pardee Dam at an elevation of 568 feet.

The construction of Woodbridge Dam in 1910 at the town of Woodbridge was a serious fish block for many years, as well as providing "often too little water for the passage of salmon" (Fry 1961). The small fishway at the dam had very little water flowing down it during summer and fall (Clark 1929). Clark also reported that only a fall run occurred, "usually quite late." He stated that a "considerable run" migrated upriver each year, although not as large as in former years, and that the flashboards in Woodbridge Dam were taken out in November to allow salmon past. Yoshiyama et al. (2001) suggested this may be an indication of a late-fall run, but that it seemed more likely that the fish for the most part were a late running fall run, delayed by the lack of water stored behind dams. The true late-fall run probably would not have been present in the Mokelumne River or other tributaries in significant numbers until December at the earliest.

San Joaquin River

The San Joaquin River at one time had the state's largest run of spring-run Chinook salmon (USFWS 1995) and the basin also had late-fall run and fall-run salmon and steelhead (USFWS 1995). Neighboring tributaries within, or bordering, the San Joaquin River Basin also had Chinook salmon and steelhead populations (DFG 1993, Yoshiyama et al. 1998). These tributaries include the Stanislaus, Mokelumne, and Cosumnes Rivers. The seasonal and species observances collected for the Calaveras River suggest that fall run, late-fall run, and spring-run salmon, and steelhead occurred in this river, as well.

Stanislaus River

The Stanislaus River watershed is larger (1,075 square miles) and has higher headwaters (greater than 10,000 feet elevation) than the Calaveras River. Today, 52 miles of river are accessible to anadromous fish. Runoff in the river is primarily from spring snowmelt but also from seasonal rainfall. Historically, the Stanislaus River supported spring and fall-run Chinook salmon and steelhead and was believed to support small populations of late-fall-run Chinook salmon. The occurrence of late-fall-run salmon has been sporadic and the population may not be self-sustaining (USFWS 1998) but recent numbers of fall-run salmon have been fairly robust with 4,000-10,000 spawners (TID/MID 2002). Rainbow trout/steelhead are known to occur in the river, although the size of the anadromous run is not known.

Historically, the spring-run was the primary run, but after construction of flow regulating dams the fall run became predominant (Yoshiyama et al. 2001). Maniery (1983) reported that Miwok residents of Murphys Rancheria, near the town of Murphys that was occupied ca. 1870-1920, caught salmon at Burns Ferry Bridge and Camp Nine (~ 13 miles upstream of the town of Melones). Yoshiyama et al. (2001) reported that as of 1995 there was essentially only the fall run, although small numbers of late-fall-run fish were said to occur (DFG 1993). A smaller run in the winter (most likely late-fall-run fish) reportedly occurred in the Stanislaus River in earlier times (DFG 1972). A miner's account of catching salmon in the river just after December 19, 1849, (Morgan 1970) suggests a run consistent with the peak migration period of the late-fall run, but also with the end of the fall run according to Fisher (1994). Yoshiyama et al. (2001) suggests late-fall-run salmon seen in recent years could be strays moving in from the Sacramento River system.

Methods

Information about salmon and steelhead presence in the Calaveras River was obtained from three sources: 1) anecdotal, 2) museum and newspaper archives, and 3) state and federal agency documentation including reports, files, and surveys. In many cases, anecdotal observations were corroborated by documented observations. Anecdotal stories were gathered from interviews of residents of the watershed in San Joaquin and Calaveras counties located through notices published one time in local San Joaquin and Calaveras County newspapers and a one-time bill insert mailed to Calaveras County Water District (CCWD) customers (see Appendix B). Interview questions (Appendix B) focused on obtaining as many details as respondents could recall regarding year, season or month, location, and conditions when they saw salmon or steelhead in the river. Bank of Stockton archives of The Record (formerly The Stockton Record) and Stockton Evening Mail newspapers from 1900 to 1940s were reviewed for early stories documenting salmon or steelhead. Primarily spring and fall issues of the newspapers were reviewed to increase the likelihood of locating pertinent stories. Appendix A, Table 2 contains transcripts of interviews with individuals providing anecdotal observations and a bibliography of documented observations.

Data from all these sources were broken out by year, location of observations, water-year type, season, and whether before or after New Hogan Dam was built. Pre- and post-dam periods correspond to the construction of New Hogan Dam in 1964. Location data consists of either specific locations (for example, the Jenny Lind bridge) or general reach or segment (for example, upstream of Jenny Lind, or downstream of Bellota Weir). Observations were reported as either specific months or seasons. General seasonal references for this study were interpreted as fall (September 1 to November 30), winter (December 1 to February 28), spring (March 1 to May 31), and summer (June 1 to August 31). Unless otherwise noted, all references to season in the study are defined by these seasonal time frames. Specific timing of Chinook salmon runs may not conform exactly to these seasonal time frames because the different salmon runs may overlap them.

These month ranges correspond best to distinctions made by interview respondents regarding seasonal events or conditions, and similar observations reported by other sources for which a month was known. For example, respondents who stated "fall" as a season often identified the month as November, and identified spring as March, April or May, or when trout-fishing season

opened, which was typically early May. In some cases, respondents could only specify an entire decade or range of years within a decade in which they recalled observing salmon or steelhead. In such cases, the observation was assigned to the decade. For example, multiple respondents observed salmon in the spring in either the early 1940s, the 1940s in general, or the late 1940s. All these observations were attributed to the decade of the 1940s. Tallies of documented and anecdotal observations include only those associated with an individual year, and observations attributed to decades or portions of decades are omitted. Only observations of adult salmon were included in reported tallies.

Migration opportunity was evaluated by comparing all documented and anecdotal observations, including those attributed to decades generally, to average daily flows occuring at the time of the observations recorded at Jenny Lind, New Hogan Dam, and Mormon Slough. Flows examined in this comparison are those that exceeded 25, 50, 100, and 200 cfs for a minimum of four days, the migration opportunity criteria. Four days is the average amount of time it would take a salmon to travel 18 miles from the river mouth upstream to Bellota, based on studies by Allen and Hassler (1986), Goldstein et al. (1999), Gray and Haynes (1979) and Heifetz (1982). Alternatively, Fishery Foundation of California (FFC) biologist Trevor Kennedy stated it could take only one day or less for healthy adult Chinook salmon to reach Bellota. He bases this conclusion on telemetry data of salmon migrating up the Cosumnes River in which he found fish traveled distances greater than 35 miles in less than 24 hours even when passage was difficult at some locations (Kennedy 8 September 2004).

Results

Chinook Salmon

Only data for the years 1930-2002 were available. Winter and summer observations came primarily from documented sources. No data were found for the period 1900-1929. No early stories were found of salmon harvest or sport fishing for either the Calaveras River or neighboring rivers. Tables 5 and 6 list all documented and anecdotal observations by location, year, season and water year type. Tables 7 and 8 summarize Chinook salmon spawning and juvenile Chinook salmon observations. Fewer observations overall are available prior to 1964 (Tables 9 and 10) because no official records were kept and fewer long-time or elderly residents are alive or could be located, and it was more difficult for repsondents to identify a specific year for their earliest pre-1964 recollections. Overall, of tallied individual year observations, more fall (September 1-November 30) and spring (March 1-May 31) season adult observations were documented because DFG was surveying for salmon that used the river during the winter in the 1970s and early 1980s, and because of USFWS fall migration surveys since 2001. Seasonally, more salmon observations overall occurred in fall (September 1-November 30) and spring. Nine observations occurred in fall, 13 in spring, seven in winter, and one in summer (June 1-August 31). Salmon were observed in more seasons during wet years than all other water-year types. There were ten observations in wet years, four in above normal, three in below normal, seven in dry and four in critical years.

Anecdotal, individual year observations, for adult salmon exists for fall (September 1-November 30), winter (December 1-February 28) and spring (March 1-May31) seasons prior to 1964. Documented evidence for adult salmon exists for all seasons after 1964. Prior to 1964,

observations were found for fish in spring in dry and critical years and in fall in below normal years. After 1964, fish observations were found for wet years in spring, fall, winter and summer (June 1-August 31). In dry years, fish observations were found for fall and winter seasons. In above normal years fish observations were found for spring and fall seasons and in below normal years fish observations were found for spring. In critical years observations of fish were found for winter. However, fall migration presents a special challenge in the post-New Hogan Dam period. Even though adequate flows may be released from New Hogan Dam, the water is diverted at Bellota, leaving migrating fish dependent on rain run-off or rare storm releases from New Hogan Dam for flows downstream of Bellota Weir. Fewer observations were found for fish upstream of Bellota in fall after 1964 (2 observations) even though more than three times as many fish observations were found downstream of Bellota (7 observations). In contrast, after 1964 more spring time observations were found for fish upstream of Bellota (9 observations) than downstream of Bellota (6 observations). After 1964 observations of fish were found for both upstream of and downstream of Bellota in most wetter and drier water-year types. Generally, during spring more fish observations were found upstream of Bellota in wetter years than in drier ones. However, across all seasons, fewer observations were found of fish upstream of Bellota in drier years (3 upstream versus 7 downstream). This suggests that in very low water years, fish were less successful in migrating upstream of Bellota even in spring-time. In wet springs, more observations occurred upstream of Bellota than downstream of. Salmon migrating in fall, even in wet years, appeared less successful in migrating upstream of Bellota than fish migrating in the spring, likely due to downstream barriers and lower fall flows in Mormon Slough leading to stranding. Summaries of documented and anecdotal Chinook salmon observations follow.

Table 5. Adult and juvenile Chinook salmon observations in the Calaveras River upstream of Bellota by year, water year type, season, and location. Footnote numbers correspond to Appendix A, Table A1. A = adult, J = juvenile, Y = yearling.

Upstream of Bellota														
Year	WY	Season	Upstream of Bellota	Between Bellota and Shelton Rd	Between Shelton & gravel plant	Jenny Lind and downstream	Upstream of Jenny Lind	Gold-dredged area downstream of canyon	Between Valley Springs & Stockton	Stranded in Cosgrove Creek	Between NHD and Bellota	Downstream of NHD	Within 1 mile Downstream of Hogan Dam	Upstream of Hogan Dam
1930 -39	B N	Fall												
1930 -39	B N	Spring				A [3]							A [4]	A [5]
1940 -49	A N	Fall						A [8]					A [9]	
1940 -49	A N	Winter						A [10]					A [11]	
1940 -49	A N	Spring				A [13, 14]							A [15]	A [16]
1949	B N	Fall					A [19]							
1949	B N	Spring												
1950	B N	Spring												
1955	D	March												
1960	C	Spring												
1960 -69	B N	Fall		A [25]										
1966	B N	Spring							A [27]					
1972	D	March												
1972	D	April - May	A [30]											
1973	A N	Spring					A [32]							
1973	A N	April												
1974	W	Spring					A [34]					A [35]		
1974	W	April										J [36]		
1975	W	Jan.												
1975	W	Spring					A [39]							
1975	W	April								A [40]		A [41]		
1975	W	June										A [42]		
1975	W	April - July										A [43]		
1976	C	Feb.												
1976	C	Spring					A [46]							
1976	C	April												
1977	C	Feb.					J [49]							

Upstream of Bellota														
Year	WY	Season	Upstream of Bellota	Between Bellota and Shelton Rd	Between Shelton & gravel plant	Jenny Lind and downstream	Upstream of Jenny Lind	Gold-dredged area downstream of canyon	Between Valley Springs & Stockton	Stranded in Cosgrove Creek	Between NHD and Bellota	Downstream of NHD	Within 1 mile Downstream of Hogan Dam	Upstream of Hogan Dam
1977	C	March or April												
1978	W	Jan.												
1978	W	Feb.												
1978	W	March												
1978	W	April												
1979	AN	March												
1982	W	Spring										A [57]		
1984	AN	April										A [58]		
1987	C	June	J [59]											
1995	W	Nov.												
1995	W	Fall					A [61]							
1995	W	Spring												
1996	W	Feb. - June									J [63]			
1997	W	Fall												
1998	W	late Oct, early Nov.												
1998	W	Oct.												
2000	AN	Fall			A [70]									
2001	D	Nov.												
2001	D	Dec.												
2002	D	Nov.												
2002	D	Dec.												
2003	BN	Nov.												
2003	BN	Dec.												
2004	D	Jan.												
2004	D	Feb.												
2004	D	Nov.												
2004	D	Dec.												

Table 6. Adult and juvenile Chinook salmon observations in the Calaveras River downstream of Bellota and spawning observations by year, water year type, season, and location. Footnote numbers correspond to Appendix A, Table A1. A = adult, J = juvenile, Y = yearling.

Downstream of Bellota									Spawning Reports				
Year	WY	Season	Tidewater to Confluence with SDC	Calaveras River Behind UOP	Old Calaveras River Channel	SDC	Mormon Slough	At Bellota	Unknown location	Mormon Slough	Jenny Lind	New Hogan Dam	Hogan Dam
1930-39	B N	Fall					A [1]						
1930-39	B N	Spring						A [2]					A [6]
1940-49	A N	Fall					A [7]						
1940-49	A N	Winter											
1940-49	A N	Spring						X [12]			A [17]		A [18]
1949	B N	Fall											
1949	B N	Spring		J [20]									
1950	B N	Spring		J [21]									
1955	D	March					A [22]						
1960	C	Spring						A [23]					
1960-69	B N	Fall					A [24]			A [26]			
1966	B N	Spring											
1972	D	March				A [28]	A [29]						
1972	D	April - May							A [31]				
1973	A N	Spring											
1973	A N	April					J [33]						
1974	W	Spring											
1974	W	April											
1975	W	Jan.				A [37]		A [38]					
1975	W	Spring											
1975	W	April											
1975	W	June											
1975	W	April - July										A [44]	
1976	C	Feb.			A [45]								
1976	C	Spring											

Downstream of Bellota									Spawning Reports				
Year	WY	Season	Tidewater to Confluence with SDC	Calaveras River Behind UOP	Old Calaveras River Channel	SDC	Mormon Slough	At Bellota	Unknown location	Mormon Slough	Jenny Lind	New Hogan Dam	Hogan Dam
1976	C	April		A [47]	A [48]								
1977	C	Feb.											
1977	C	March or April					A [50]						
1978	W	Jan.			A [51]								
1978	W	Feb.			A [52]								
1978	W	March						A [53]					
1978	W	April						A [54]					
1979	AN	March						A [55]					
1982	W	Spring						A [56]					
1984	AN	April											
1987	C	June											
1995	W	Nov.						A [60]					
1995	W	Fall											
1995	W	Spring		J [62]									
1996	W	Feb - June											
1997	W	Fall					A [64]	A [65]		A [66]			
1998	W	late Oct., early Nov.						A [67]					
1998	W	Oct.				A [68]	A [69]						
2000	AN	Fall											
2001	D	Nov.				A [71]							
2001	D	Dec.					A [72]	A [73]		A [74]			
2002	D	Nov.				A [75]							
2002	D	Dec.					A [76]			A [77]			
2003	BN	Nov.				A [78]							
2003	BN	Dec.	A [79]				A [80]						
2004	D	Jan.					A [81]	A [82]					
2004	D	Feb.					A [83]						

Downstream of Bellota									Spawning Reports				
Year	WY	Season	Tidewater to Confluence with SDC	Calaveras River Behind UOP	Old Calaveras River Channel	SDC	Mormon Slough	At Bellota	Unknown location	Mormon Slough	Jenny Lind	New Hogan Dam	Hogan Dam
2004	D	Nov.	A[84]										
2004	D	Dec.	A[85]		A[86]	A[87]							

Table 7. Reports of spawning Chinook salmon in the Calaveras River.

Spawning Reports			
Year	*Season*	*Location*	*Source*
1930-39	Spring	Calaveras River Park downstream of old Hogan Dam	Fred "Bud" Day
1940-44	Spring	Calaveras River Park downstream of old Hogan Dam	Fred "Bud" Day
1945-49	Spring	Mallard Bend downstream Jenny Lind bridge	John Prioli
1960-69	Fall	Mormon Slough between Fine and Flood Roads	Fred Solari
1972	April-May	Calaveras River upstream of Bellota; no location reported	Anecdotal DFG (1975c)
1975	April-July	Downstream of New Hogan Dam	DFG (1975d)
1997	Fall	Between Fine and Flood Roads	Fred Solari
2001	December	Mormon Slough downstream of Bellota Weir	DWR 2003, FCC 2004
2002	December	Mormon Slough downstream of Bellota Weir	DWR 2003, FCC 2004

Note: All sources referenced in Appendix A.

Table 8. Reports of juvenile Chinook salmon in the Calaveras River.

Juvenile Reports				
Year	*Season*	*Description*	*Location*	*Source*
1949	Spring	juveniles	University of the Pacific	John Prioli
1950	March	juveniles	University of the Pacific	John Prioli
1973	April	yearling	Downstream of Bellota	DFG 1975c
1974	April	yearling	Downstream of New Hogan Dam	DFG 1974a
1977	February	yearling	Upstream of Jenny Lind	USFWS 1989
1987	June	yearling	Upstream of Bellota	USFWS 1989, 1993
1995	Spring	smolt	UOP	Tom Taylor
1996	Feb-June	juveniles	Between Bellota and New Hogan Dam	DFG 1996

Note: All sources referenced in Appendix A.

Table 9. Number of anecdotal and documented adult salmon observations upstream of or downstream of Bellota Weir.

Anecdotal Upstream of Bellota	Anecdotal Downstream of Bellota	Documented Upstream of Bellota	Documented Downstream of Bellota
9	9	7	28

Note: Table excludes observations attributed to a range of years.

Table 10. Number of anecdotal and documented adult salmon observations before and after 1964.

Anecdotal Pre-1964	Anecdotal Post-1964	Documented Pre-1964	Documented Post-1964
3	16	0	35

Note: Table excludes observations attributed to a range of years.

Documented Observations

Humans have used the Calaveras River and its tributaries for thousands of years. There are archeological sites in the area with evidence of Native Americans. The Miwok tribe commonly used the area for hunting and fishing. However, pre-dam documentation of salmon runs is extremely limited. The historian Sanchez (as cited in DFG 2001) noted entries in Moraga's diary referring to river tribes fighting against Sierra tribes for possession of the salmon in the river. Moraga is said to have named the river Las Calaveras after the skulls and bones scattered along the creek bed, supposed relics of these bloody conflicts. Fenenga (1969) excavated middens on the north bank of Mormon Slough, three miles east of the city of Stockton, and recovered spearing artifacts likely used for salmon. According to Tinkham (1880), Stockton Slough contained, "an abundance of every description of fish. There are salmon, trout, sturgeon, and an infinite variety of the smaller kinds to the hearts content." Gobalet et al. (2004) reviewed the record of fish remains from California archeological sites. Oncorhynchus (Chinook salmon or steelhead trout) remains were found in Calaveras and San Joaquin Counties.

The USFWS (1993) reported unconfirmed reports of large runs of adult anadromous salmonids entering the Calaveras River in the early 1900s, and the existence of a small population of fall-run Chinook salmon prior to New Hogan Dam. In the 1940s, Stockton illustrator, Ralph Yardly, drew early Stockton scenes from photographs including two scenes depicting early winter flooding in 1906 and 1907 in Mormon Slough (Figures 6 and 7). In the two scenes men are shown standing on a bridge over the flooded channel with gaff hooks, poised to spear fish coming up river. The gaffs held by the anglers, and the time of year, suggest the presence of salmon. DFG (1963) noted that "occasionally steelhead and king salmon enter the drainage but only in insignificant numbers and at irregular intervals," which Yoshiyama et al. (2000) consider almost certainly fall–run Chinook. Clark (1929, as cited in Yoshiyama et al. 2001) reported that the river was "dry most of the summer and fall" and so had no salmon. Clark may have been only considering a fall-run of salmon. E. Gerstung, retired DFG fishery biologist, considered the stream habitat of the north and south forks upstream of New Hogan Dam marginal for salmon with no over-summering habitat for spring-run fish[1]. A 1960 USFWS report titled "A Detailed Report on Fish and Wildlife Resources Affected by New Hogan Project, Calaveras River, California, October 1960" documented the presence of Chinook salmon in the river (as cited in USACE 1981). A 1980 USFWS planning aid letter (as cited in USACE 1981) used historic quantity and timing of streamflow to estimate that about 2,000 winter-run Chinook salmon and 500 fall and spring-run Chinook salmon, and 500 steelhead trout could have ascended the river to spawn prior to construction of New Hogan Dam.

Documented salmon observations are more common after the construction of New Hogan Dam. DFG (1993) documents a run of salmon in winter that spawned in late winter and spring, but said it is unknown whether it existed before the river was dammed. This winter run was documented by DFG six times from 1972 to 1984 and numbered 100 to 1,000 fish annually. Yoshiyama et al.

[1] Gerstung is associated in Yoshiyama et al. 2001 with a general statement about the Calaveras River having probably always been marginal for salmon and lacking suitable spawning habitat for spring Chinook salmon. In a June 2004 conversation with the author, Gerstung noted that he had never worked on the lower Calaveras River and was referring to the upper river upstream of New Hogan Dam. His opinion of the habitat was based on the over-summering requirements of spring-run salmon and what he knew of the largest tributaries, the north and south forks. He considered them too small to support spring-run salmon over the summer months.

(2000) do not consider this winter run an indigenous natural run because the Calaveras River originally did not have year-round conditions suitable to support the native winter run. These authors assert that the stock established itself as a result of coldwater releases from New Hogan reservoir and later was extirpated by the multi-year severe drought of the late 1980s.

In recent years, fall-run salmon entered the river in 1995, 1997, 1998, 2000, 2001 and 2002, 2003, and 2004 when suitable fall stream flows occurred. These runs were documented by either DFG, the FFC, DWR, or in The Record, a Stockton newspaper. Observed fish numbered from fewer than a dozen to several hundred in fall 1995 (DFG unpublished data, as cited in Yoshiyama et al. 2001). During February through June 1996 DFG biologist Maury Fjelstad conducted juvenile Chinook surveys and found age 0 + Chinook salmon juveniles rearing in the river between Bellota and New Hogan Dam indicating the 1995 run had spawned successfully (DFG 1996). Up to 28 salmon were documented by FFC biologists in Mormon Slough in fall and winter 2003 and 2004 including several in December 2004 found stranded in the old Calaveras channel (FFC unpublished data).

Anecdotal Observations

Residents living along Mormon Slough and anglers fishing upstream have observed salmon in the Calaveras River on numerous occasions. These observation excerpts are from Appendix A, Table A2, Anecdotal Sources Interview Transcripts. According to Stockton resident, Ray Schenone, the salmon generally came up "with the floods" and were not noticed because they "moved right through" and the water was turbulent and deep in Mormon Slough. In March 1955 Schenone found 200 - 300 salmon trapped in the pool downstream of an old railroad trestle in Mormon Slough at Potter Creek (Figure 2). The salmon were unable to pass the boulders and riprap put in the channel to protect the trestle. In March 1972, Schenone caught four salmon at Jack Tone Road bridge in Mormon Slough (Figure 8).

Another Stockton resident, John Prioli, recalled attempts to snag salmon or steelhead from "deep ponds" near the Jenny Lind Bridge (Figure 2) while fishing for black bass in February through April in the mid- to late-1940s. At the same time, he also recalled seeing salmon spawning at Mallard Bend (Figure 2), a wide bend in the river downstream of the bridge. Prioli trapped juvenile salmon in the river behind the University of the Pacific campus (Figure 2) in the spring of 1949 and 1950 with his college biology instructor, Verna Johnston.

Fred Solari of Stockton recalled his father's stories of catching salmon in the 1930s and 1940s in the fall from Mormon Slough, where the old Solari grocery is on Highway 26 and Fine Road east of Linden (Figure 2). Solari said that before Mormon Slough was modified in the late 1960s it was "more wild". It had pools as deep as 30 feet, tree-lined banks, and waterfalls over hardpan drops. These pools were eliminated when the channel was flattened and widened into a larger flood control channel.

While fishing during the opening of trout season in the spring, Jeff Andrews of San Andreas recalled seeing very large, scarred and beat up runs of salmon between New Hogan Dam and Jenny Lind in four consecutive years of the mid 1970s. During that time he saw another angler catch a 36-inch salmon that was fresh and still had good color. These observations are supported by DFG documentation from the same period.

Fred Day, a 90-year-old life-long Calaveras County resident, saw salmon whenever there was a "wet spring" during the 1930s and early 1940s. From 1930-1944 he worked at the then just-completed Hogan Dam (1930) (Figure 9). Here is an account of his recollections:

> "I was working at Hogan Dam about four to five years after it was completed and recall the water flows being extremely heavy during spring-runoff (author's note: he says this was in the early 1930s and is not sure of the exact year). I was pumping cement into forms at the dam to seal cracks. The winter had been severe and there was considerable snowmelt, which produced a very heavy flow. It was March or April and it had been raining for two to three days. Water had overtopped the diverting canal in Stockton and had almost reached Highway 26 at Linden. I was on my way back up to the dam from Stockton where I had been picking up some material. I had to beat the water before it covered the road. I drove past Solari store, past Bellota to where the road goes past Duck Creek. There I saw a car stuck on the road covered up to its roof by water. I had to turn around, backtrack to the store and take an alternate route through Clements to reach the dam. On my way I noted that Valley Springs/Larson Flat were flooded by Lime Creek. Lime Creek flows into Silver Rapids which flows into the Calaveras River" (See Valley Springs in Figure 2).
>
> "The water was so high behind the dam that all nine water outlet "holes" through the dam were gushing full-time, and water covered the bridge and the cattle fencing all around the river. There was a 3-foot wide catwalk at the bottom of the dam where 8-inch valves were. I, my brother and cousin (author's note: all three worked at the dam) saw lots of salmon trying to come through the holes in the dam, some falling down the face of the dam, some hitting the valves as they fell. The salmon fell across the catwalk and were longer than the catwalk was wide. The salmon leaped at the water gushing out of the holes. Some of the leaping salmon made it through to the upstream side of the dam. Later that spring or early summer, I walked upstream of the dam after all the water had gone down. Large sand flats were left behind. I found salmon skulls with the big hooked jaws up there. I saw salmon in the Calaveras downstream of the dam most every spring when the water flows were high. The wet years were when I saw the most salmon. When I was 13 or 14 years old, (author's note: this would have been in the mid 1920s) there was substantial water flow in all the streams in Calaveras County, and the winter was severe, very wet, very snowy, compared to the present. I do not recall seeing a fall run of salmon, which would not have been possible most years because there was not enough water then to support the fish coming up the river. In addition, there was a spot upstream of the dam (now at the upstream end of the reservoir at North Branch Road) called "the falls" where fish may have not been able to get past. These falls were later blasted when the new reservoir was completed to allow fish to migrate out of the reservoir to spawn upstream".
>
> "I saw salmon many times downstream of the old Jenny Lind bridge, which spanned the Calaveras and led to the town of Milton. Fish 3-feet long were common there. I also caught steelhead from the old bridge. Salmon were seen

regularly at Calaveras River Park, about 100-200 yards downstream of the dam, in a large swimming hole that probably measured 70-80 feet across. I and my wife would catch steelhead in this pool in spring and early summer. The salmon spawned there. One of my jobs was to maintain the rain gauge near Bellota at the road to Farmington. I changed the paper in it each Saturday and I would see salmon at Bellota. As a boy, I fished the local tributary streams for trout; these were Jesus Maria, O'Neill Creek, Murray Creek and others. I caught trout in nearly every stream in this county when I was a boy. I caught nice big trout around 14-inches long or longer (indicated with hands). I also fished the Calaveras River upstream of Hogan Reservoir, and found skeletons of salmon with big, hooked jaws upstream of San Andreas (Figure 2) in an area known as The Narrows".

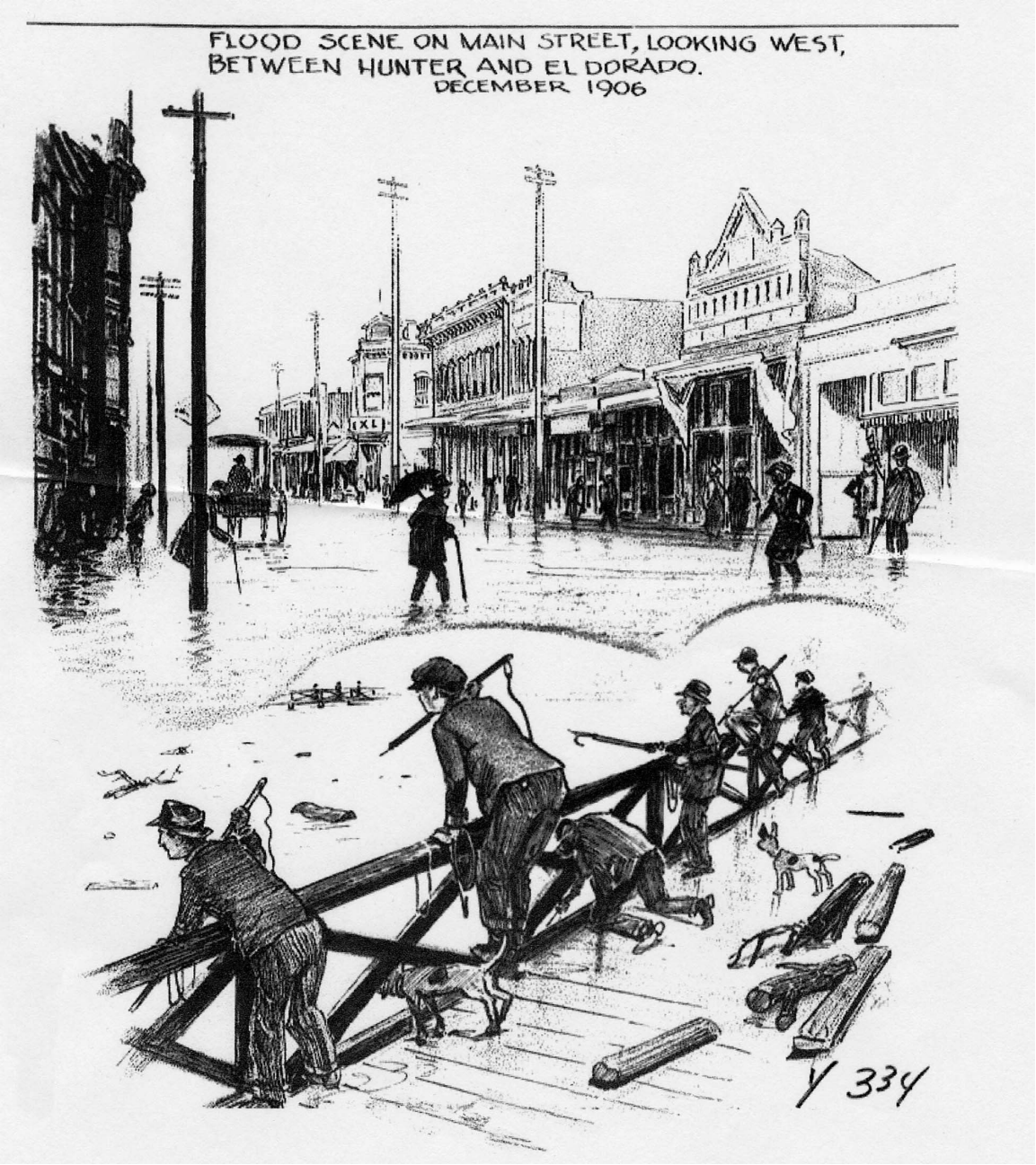


Figure 6. Stockton flood scene, December 1906. Haggin Museum Library archive, Stockton, California.

Figure 7. Flooded Mormon Channel, Stockton, 1907. Haggin Museum Library Archive, Stockton, California.

Figure 8. Ray Schenone (right) with salmon caught in Mormon Slough, March 1972. Credit: Ray Schenone, Stockton, California.

Figure 9. Hogan Dam, showing water outlet holes. The dam is shown upstream behind New Hogan Dam, under constructin in the foreground. Calaveras River. Haggin Museum Library Archive, Stockton, California. Circa 1963.

Steelhead

The following information is from anecdotal and a few documented sources. Local anglers reported catching steelhead from the Calaveras River in spring and early summer in the 1930s, November to January in the 1940s, 1960s and 70s, and in spring in 1998. In the 1930s, Fred Day and his wife caught steelhead in the Calaveras River Park pool (about 100-200 yards downstream of former Hogan Dam, now inundated by New Hogan Dam) in spring and early summer, and he also caught steelhead from the Jenny Lind bridge. As a youngster in the early 1940s, John Prioli recalled seeing salmon and steelhead in the river while walking the gold-dredged areas upstream from November through January. Brian Cudney of Valley Springs recalled catching steelhead in the fall or winter from the Jenny Lind bridge in the 1960s and 1970s. In spring 1998 Fred Solari caught two 18-inch steelhead between Fine Road at Avisino Dam in Mormon Slough. Ninety-two-year-old Murphys resident, Lois Ostrowski Schachten, recalled that her husband and young sons fished for steelhead on the Calaveras River in the spring, usually in May (author's note: this could have been around the 1940s). Her sister-in-law, Maisi Schachten, was born and raised in the town of Murphys on the Stanislaus River. Over 50 years ago, her husband fished the Stanislaus with local Indian friends, as did his father in the late 1800s. They caught steelhead by the basketfuls just upstream of Murphys at 2,171 feet elevation. The fact that trout were fished from Calaveras River tributary streams at similar elevations as the Stanislaus argues that steelhead were likely historically present in the river before it was dammed.

On March 5, 1979, DFG biologist Charlie Young observed 14-16 inch rainbow trout or steelhead attempting to negotiate Bellota Weir, and 4-6 pound steelhead downstream of the weir, as well (DFG 1979). In March 2000, DFG documented steelhead and resident rainbow trout stranded

downstream of New Hogan Dam after flood control releases were suddenly decreased. In April 2002, FFC biologists found a 28.75-inch, half-dead and spawned-out female steelhead upstream of the low-flow crossing downstream of Bellota weir. FFC biologists also found several live and dead adult steelhead in Mormon Slough in late March and early April 2002 along with steelhead redds in riffles downstream of Bellota Weir. Yearling trout, possibly steelhead smolts, were also captured in the same area (FFC 2004). In fall 2002 the FFC and SPC found dead adult steelhead in both Mormon Slough and the old Calaveras channel downstream of Bellota, presumably having over-summered but then died when the irrigation season ended and the channel became dry (FFC 2004). FFC snorkel surveys of the lower river downstream of New Hogan Dam in 2002 indicate a large population of rainbow trout exists and naturally reproduces in the reach (FFC 2004). While conducting passage surveys in Mormon Slough from November 2003 to March 2004, FFC biologists documented live outmigrating *O. mykiss* smolts (smolt index 3 to 5) in the pool downstream of Bellota Weir and further downstream. Since January 2002 SPC has intermittently monitored outmigrating rainbow trout (*O. mykiss*) with a screw trap at Shelton Road, upstream of Bellota. Biologists have documented smolt size fish (smolt index size $\geq$ 5) each year with 146 smolts in 2002, 103 in 2003, 194 in 2004, and 34 in 2005 (data are numbers of captured fish, not expanded data) (SPC unpublished data).

Migration Opportunity

Comparing observations of salmon and steelhead in the river with seasonal availability of flows and channel conditions is one way to evaluate whether adult salmon could have had the opportunity to migrate up the Calaveras River and thus have historically used the river. Tables 11 to 20 list years and seasons in which average daily flows exceeded 25, 50, 100 and 200 cfs for periods of at least 4 days, the migration opportunity criteria, over the period of record for Jenny Lind, New Hogan Dam, and Mormon Slough gauges. Fall (September 1-November 30) and spring seasons include irrigation season flows when flashboard dams are in use in Mormon Slough. In order to evaluate unregulated flow in Mormon Slough only non-irrigation season dates are included, October 15 to November 30 (fall) and March 1 to April 15 (spring). In most years, average daily flows in the Calaveras River in fall, winter, and spring from 1930 to 2004 met the migration opportunity criteria. In each decade flows were available in the year and season when adult Chinook salmon and steelhead observations were made. The percentage of average daily fall flows exceeding 50 or 200 cfs for a minimum of 4 days is higher after New Hogan Dam was built. Percentage changes in winter (December 1-February 28) and spring (March 1-May 31) flows meeting the migration opportunity criteria is much smaller between the pre- and post-dam periods (Figure 10).

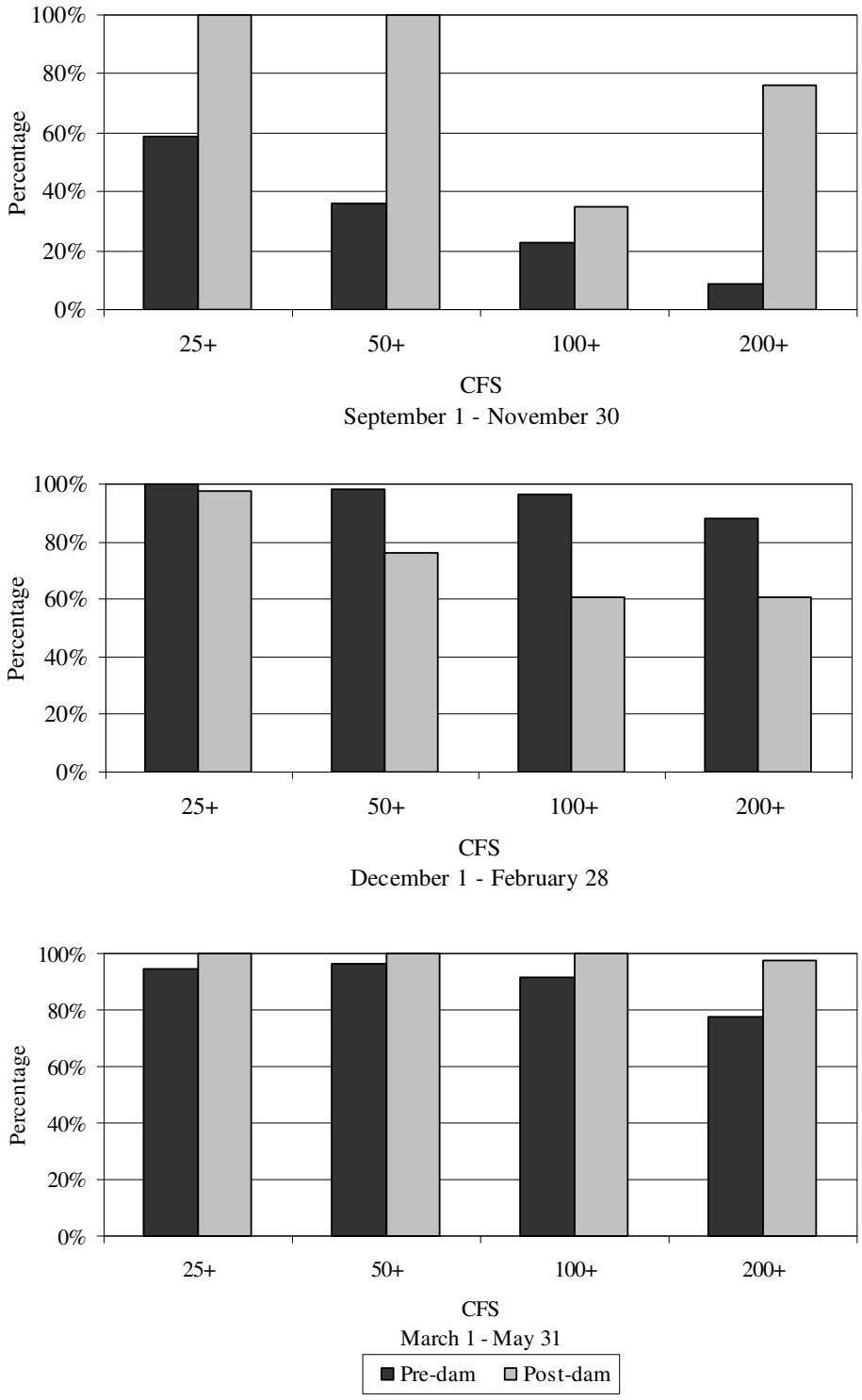


Figure 10. Percentage of years by season in which average daily flows exceeded 25, 50, 100, and 200 cfs for at least 4 days over period of record before and after New Hogan Dam regulated the river. Data: Jenny Lind 1907-1964, USGS. New Hogan Dam 1965-2002, USACE.

1930s

During the 1930s salmon were observed in the fall in Mormon Slough and in the spring both upstream of and downstream of Bellota and spawning downstream of Hogan Dam. Salmon skeletons were found upstream of Hogan Dam. Fall flows at Jenny Lind exceeded 25 cfs for 4 days or more in 1937 and 1938 which could have attracted fish into the river (Table 11). Spring flows exceeded 25, 50, 100, and 200 cfs in most years providing opportunities for juvenile salmonid out migration and adult steelhead and spring-run salmon migration, supporting spring-time observations.

Table 11. Years 1930-39 in which average daily flows exceeded 25, 50, 100, 200 cfs for at least 4 days over period of record in Fall, Winter and Spring at Jenny Lind.

Jenny Lind – Pre-dam period													
Year Type	Year	Fall September 1 - November 30				Winter December 1 - February 28				Spring March 1 – May 31			
		25+	50+	100+	200+	25+	50+	100+	200+	25+	50+	100+	200+
C	1930					x	x	x	x	x	x	x	x
C	1931					x	x	x		x	x		
AN	1932					x	x	x	x	x	x	x	
D	1933					x	x	x	x	x	x	x	
C	1934					x	x	x	x	x	x	x	x
AN	1935					x	x	x	x	x	x	x	x
AN	1936					x	x	x	x	x	x	x	x
W	1937	x				x	x	x	x	x	x	x	x
W	1938	x				x	x	x	x	x	x	x	x
D	1939					x	x	x	x	x	x	x	

1940s

During the 1940s river flows provided opportunities for juvenile salmonid out migration and adult steelhead and fall-, late fall- and spring-run salmon to migrate to Bellota and move upstream. Salmon were observed in the fall in Mormon Slough and upstream of Bellota, in spring at Bellota and upstream at Jenny Lind and Hogan Dam, and in the winter upstream of Bellota. Spawning was observed in spring downstream of Hogan Dam. Juveniles captured in spring 1949 and spring 1950 in the Old Calaveras channel indicate spawning occurred in fall 1948 and fall 1949. Adult salmon were observed upstream of Jenny Lind in fall 1949, a below normal year. According to observations by Trevor Kennedy, FCC biologist, flows less than 100 cfs have been enough to attract salmon into the lower river downstream of Mormon Slough and into Mormon Slough itself. During the 1940s such flows would have been generated by rainfall and runoff caused by storms. In 1948 fall flows did not exceed even 20 cfs until early November for a few days at a time. Spawning fish may not have had migration opportunities until December when flows exceeded 25, 50 and 100 cfs. In fall 1949 flows at Jenny Lind did not exceed 25 cfs for any 4 day period, although flows between 16 – 38 cfs did occur in early and mid-November and 62 cfs from November 29 through December 2. Such flow spikes could have attracted fish into the river. Fall flows at Jenny Lind exceeded 25 cfs in many years and also exceeded 50, 100 and 200 cfs in several years. Spring flows exceeded 25, 50, 100, and 200 cfs in all years. Winter flows exceeded 25, 50, 100, and 200 cfs in all years except 1948 (Table 12).

Subsequently, winter and spring-time flows in 1948 and 1949 could have been sufficient to provide migration and spawning flows in the river upstream.

Table 12. Years 1940-49 in which average daily flows exceeded 25, 50, 100, 200 cfs for at least 4 days over period of record in Fall, Winter and Spring at Jenny Lind.

Jenny Lind – Pre-dam period													
Year Type	Year	Fall September 1 - November 30				Winter December 1 - February 28				Spring March 1 – May 31			
		25+	50+	100+	200+	25+	50+	100+	200+	25+	50+	100+	200+
AN	1940	x				x	x	x	x	x	x	x	x
W	1941					x	x	x	x	x	x	x	x
W	1942	x	x	x	x	x	x	x	x	x	x	x	x
W	1943	x				x	x	x	x	x	x	x	x
BN	1944	x	x	x	x	x	x	x	x	x	x	x	x
AN	1945	x	x			x	x	x	x	x	x	x	x
AN	1946	x	x	x		x	x	x	x	x	x	x	x
D	1947	x				x	x	x	x	x	x	x	x
BN	1948					x	x	x		x	x	x	
BN	1949					x	x	x	x	x	x	x	x

1950s

River flows during the 1950s once again provided opportunity for juvenile salmonid out migration and adult steelhead and fall and spring-run salmon migration. Juvenile salmon were observed in the lower river in spring 1950. In March 1955, a dry water year, Stockton resident Ray Schenone observed adult salmon stranded in a pool downstream of the railroad trestle and outlet of Potter Creek in Mormon Slough. In February 1955 flows at Jenny Lind ranged from 36-71 cfs and could have attracted fish into the channel. Peak flow at the Stockton Diverting Canal gauge that month was 36 cfs. Subsequently, March flows dropped to 10-20 cfs, stranding fish. Fall flows exceeded 25 and 50 cfs in most years; spring flows exceeded 25, 50, and 100 cfs in all years; and winter flows exceeded 100 cfs in all years and 200 cfs in all but one year (Table 13).

Table 13. Years 1950-59 in which average daily flows exceeded 25, 50, 100, 200 cfs for at least 4 days over period of record in Fall, Winter and Spring at Jenny Lind.

Jenny Lind – Pre-dam period													
Year Type	Year	Fall September 1 - November 30				Winter December 1 - February 28				Spring March 1 – May 31			
		25+	50+	100+	200+	25+	50+	100+	200+	25+	50+	100+	200+
BN	1950	x	x	x	x	x	x	x	x	x	x	x	x
AN	1951	x	x			x	x	x	x	x	x	x	
W	1952	x	x	x		x	x	x	x	x	x	x	x
BN	1953	x	x			x	x	x	x	x	x	x	
BN	1954	x				x	x	x	x	x	x	x	x
D	1955					x	x	x	x	x	x	x	
W	1956	x	x	x		x	x	x	x	x	x	x	x
BN	1957					x	x	x		x	x	x	x
W	1958	x	x	x		x	x	x	x	x	x	x	x
D	1959					x	x	x	x	x	x	x	

1960s

This period encompasses both pre- and post-New Hogan Dam flow conditions. Flows during both periods provided opportunity for juvenile out migration and adult steelhead and fall- and spring-run salmon migration. During the 1960s salmon were observed in the fall in Mormon Slough and upstream between Bellota and Shelton Road. In spring 1960, a critical water year, salmon were observed at Bellota. From March to May no flows at Jenny Lind exceeded 25 cfs for any 4 day period. However a flow spike up to 146 cfs occurred in mid-March possibly attracting and then stranding fish in Mormon Slough. In spring 1966, a below normal year, salmon were observed between Valley Springs and Stockton. Flows at New Hogan Dam exceeded 200 cfs from March through May which would have provided ample opportunity for salmon to migrate upstream before the existing flashboard dams in the Stockton Diverting Canal were set up for the irrigation season. Prior to New Hogan Dam construction, fall flows between 1960 and 1964 at Jenny Lind exceeded 25, 50 and 100 cfs (Table 14). After New Hogan Dam construction, fall flows between 1965-69 at New Hogan Dam exceeded 25, 50, 100 and 200 cfs and higher fall flows became typical due to regular water releases for downstream irrigation (Table 15).

Table 14. Years 1960-64 in which average daily flows exceeded 25, 50, 100, 200 cfs for at least 4 days over period of record in Fall, Winter and Spring at Jenny Lind.

Jenny Lind – Pre-dam period													
Year Type	Year	Fall September 1 - November 30				Winter December 1 - February 28				Spring March 1 – May 31			
		25+	50+	100+	200+	25+	50+	100+	200+	25+	50+	100+	200+
C	1960					x	x	x	x				
C	1961	x				x							
BN	1962	x	x			x	x	x	x	x	x	x	x
AN	1963	x	x	x		x	x	x	x	x	x	x	x
D	1964					x	x			x	x		

Table 15. Years 1965-69 in which average daily flows exceeded 25, 50, 100, 200 cfs for at least 4 days over period of record in Fall, Winter and Spring at New Hogan Dam.

New Hogan Dam - Post-dam Period													
Year Type	Year	Fall September 1 - November 30				Winter December 1 - February 28				Spring March 1 – May 31			
		25+	50+	100+	200+	25+	50+	100+	200+	25+	50+	100+	200+
W	1965	x	x	x		x	x	x	x	x	x	x	x
BN	1966	x	x	x		x	x	x	x	x	x	x	x
W	1967	x	x	x	x	x	x	x	x	x	x	x	x
D	1968	x	x	x		x				x	x	x	x
W	1969	x	x	x		x	x	x	x	x	x	x	x

1970s

Flows during the 1970s provided opportunity for juvenile salmonid out migration and migration of adult steelhead and unidentified runs of salmon in winter and spring seasons. In March 1972, a dry water year, more than 200 salmon stranded in the Stockton Diverting Canal were rescued and transported upstream of Bellota by DFG and local volunteers (Anonymous 1972). Salmon were observed spawning upstream of Bellota in April and May 1972. Salmon were aided during that period by flows up to 295 cfs at the New Hogan Dam gauge and 50 cfs at the Stockton Diverting

Canal gauge. In 1972, 1975, and 1976 salmon were observed downstream of Bellota and subsequently observed upstream in the spring accounting for some of the spring observations upstream. In springs of 1973, 1974, 1975 and 1976 flows exceeded 200 cfs at New Hogan Dam and adult or yearling salmon were observed upstream of Bellota (Table 16). Flows exceeding 200 cfs occurred from June to July of 1975 when salmon were observed spawning or holding downstream of New Hogan Dam. Such flow conditions support observations of spawning adults and yearling salmon upstream of Bellota Weir. Typically, however, flows were much less in Mormon Slough downstream of Bellota, attracting fish into the channel but resulting in strandings in April 1976 and April 1977 after irrigation dams had been installed that blocked further fish movement. In March 1979 salmon and steelhead or rainbow trout were observed at Bellota, but no salmon were observed upstream even though flows exceeded 200 cfs at New Hogan Dam in spring that year.

Table 16. Years 1970-79 in which average daily flows exceeded 25, 50, 100, 200 cfs for at least 4 days over period of record in Fall, Winter and Spring at New Hogan Dam.

New Hogan Dam - Post-dam Period													
Year Type	Year	Fall September 1 - November 30				Winter December 1 - February 28				Spring March 1 – May 31			
		25+	50+	100+	200+	25+	50+	100+	200+	25+	50+	100+	200+
AN	1970	x	x	x	x	x	x	x	x	x	x	x	x
BN	1971	x	x	x	x	x	x	x	x	x	x	x	x
D	1972	x	x	x	x	x	x	x	x	x	x	x	x
AN	1973	x	x	x		x	x	x	x	x	x	x	x
W	1974	x	x	x	x	x	x	x	x	x	x	x	x
W	1975	x	x	x	x	x	x	x	x	x	x	x	x
C	1976	x	x	x	x	x	x	x	x	x	x	x	x
C	1977	x	x	x	x	x	x	x	x	x	x	x	x
W	1978	x	x	x	x	x				x	x	x	x
AN	1979	x	x	x	x	x	x	x	x	x	x	x	x

1980s

Flows during the 1980s provided opportunity for juvenile out migration and migration of adult steelhead and unidentified runs of salmon in spring season, and holding of yearling salmon in summer. In spring 1982 and 1984, wet and above normal years, respectively, salmon were observed downstream of and upstream of Bellota. Flows at New Hogan Dam exceeded 200 cfs, supporting upstream observations. These fish must have moved upstream prior to irrigation dam installation. Likewise in June 1987 flows exceeded 200 cfs when yearling salmon were observed downstream of New Hogan Dam (Table 17).

Table 17. Years 1980-89 in which average daily flows exceeded 25, 50, 100, 200 cfs for at least 4 days over period of record in Fall, Winter and Spring at New Hogan Dam.

New Hogan Dam - Post-dam Period													
Year Type	Year	Fall September 1 - November 30				Winter December 1 - February 28				Spring March 1 – May 31			
		25+	50+	100+	200+	25+	50+	100+	200+	25+	50+	100+	200+
W	1980	x	x	x	x	x	x	x	x	x	x	x	x
D	1981	x	x	x	x	x				x	x	x	x
W	1982	x	x	x	x	x	x	x	x	x	x	x	x

W	1983	x	x	x	x	x	x	x	x	x	x	x	x
AN	1984	x	x	x	x	x	x	x	x	x	x	x	x
D	1985	x	x	x	x	x				x	x	x	x
W	1986	x	x	x	x	x	x	x	x	x	x	x	x
C	1987	x	x	x	x	x	x			x	x	x	x
C	1988	x	x	x		x				x	x	x	
C	1989	x	x			x				x	x	x	x

1990s

Flows during the 1990s provided opportunity for juvenile salmonid out migration and adult steelhead and fall-run salmon migration into Mormon Slough in spring and fall, respectively, and supported spawning and juvenile rearing upstream of Bellota. In fall 1995, 1997, and 1998, all wet years, salmon were observed at Bellota or stranded downstream. Salmon were observed upstream of Bellota in 1995 after fish trapped in Mormon Slough were transported upstream. The capture of juvenile salmon in spring 1996 upstream of Bellota confirms that these salmon spawned (DFG 1996). Anglers reported catching steelhead in spring 1998. Fall flows at New Hogan Dam exceeded 50 cfs in all years and 200 cfs in all but two years (Table 18). Fall flows between September 1 and October 15 in Mormon Slough exceeded 25, 50 and 100 cfs in 1998; no flow data is available for 1995 and 1997.

Table 18. Years 1990-99 in which average daily flows exceeded 25, 50, 100, 200 cfs for at least 4 days over period of record in Fall, Winter and Spring at New Hogan Dam.

New Hogan Dam - Post-dam Period													
Year Type	Year	Fall September 1 - November 30				Winter December 1 - February 28				Spring March 1 – May 31			
		25+	50+	100+	200+	25+	50+	100+	200+	25+	50+	100+	200+
C	1990	x	x			x	x			x	x	x	x
C	1991	x	x	x	x					x	x	x	x
C	1992	x	x			x				x	x	x	x
W	1993	x	x	x	x	x	x			x	x	x	x
C	1994	x	x	x	x	x	x			x	x	x	x
W	1995	x	x	x	x	x	x			x	x	x	x
W	1996	x	x	x	x	x	x	x	x	x	x	x	x
W	1997	x	x	x	x	x	x	x	x	x	x	x	x
W	1998	x	x	x	x	x	x	x	x	x	x	x	x
AN	1999	x	x	x	x	x	x	x	x	x	x	x	x

2000s

Flows during the period 2000-2004 provided the opportunity for juvenile salmonid out migration and adult steelhead and fall-run salmon migration into Mormon Slough. Salmon were stranded in Mormon Slough in fall 2000, an above normal year, and in fall 2001 and fall 2002, both dry years. In late November 2001 fish were stranded in the Stockton Diverting Canal at Budiselich Dam. Peak flow that month at the Mormon Slough gauge was 23 cfs and at New Hogan Dam it was 66 cfs. USFWS biologist Gonzalo Castillo and FFC biologist Trevor Kennedy reported stranding in late November at Budiselich Dam in 2002 and 2003 when peak recorded flow at Mormon Slough was less than 10 cfs and at New Hogan Dam 50 cfs and 44 cfs, respectively. The FFC conducted surveys for Chinook salmon in Mormon Slough in Fall 2003 and 2004 and found live and dead salmon stranded in various locations from tidewater to Bellota Weir (FFC

unpublished data). In addition, several live and dead steelhead were found in Mormon Slough in March and April 2002 along with steelhead redds. Snorkel surveys downstream of New Hogan Dam in 2002 indicated a large rainbow trout population. From November 2003 to March 2004 FFC biologists documented outmigrating *O. mykiss* smolts in the pool downstream of Bellota and downstream in Mormon Slough. In addition, since January 2002 SPC biologists have documented smolt size fish upstream at Shelton Road. Fall flows at New Hogan Dam exceeded 200 cfs in 2000, 2001, and 2002 (Table 19). Fall flows in Mormon Slough exceeded 25 and 50 cfs in 2000 and 2001, and only 25 cfs in 2002 and 2003 (Table 20).

Table 19. Years in which average daily flows exceeded 25, 50, 100, 200 cfs for at least 4 days over period of record in Fall, Winter and Spring at New Hogan Dam.

New Hogan Dam - Post-dam Period													
Year Type	Year	Fall September 1 - November 30				Winter December 1 - February 28				Spring March 1 – May 31			
		25+	50+	100+	200+	25+	50+	100+	200+	25+	50+	100+	200+
AN	2000	x	x	x	x	x	x	x	x	x	x	x	x
D	2001	x	x	x	x	x	x			x	x	x	x
D	2002	x	x	x	x	x				x	x	x	x
BN	2003	x	x	x		x	x			x	x	x	
D	2004	x	x	x		x	x			x	x	x	

Table 20. Years in which average daily flows exceeded 25, 50, 100, 200 cfs for at least 4 days over period of record in Fall, Winter and Spring at Mormon Slough.

Mormon Slough													
Year Type	Year	Fall October 15-November 30				Winter December 1 - February 28				Spring March 1 – April 15			
		25+	50+	100+	200+	25+	50+	100+	200+	25+	50+	100+	200+
W	1998	x	x	x		x	x	x	x	x	x	x	x
AN	1999	x	x			x	x	x	x	x	x	x	
AN	2000	x	x			x	x	x	x	x	x	x	x
D	2001	x	x			x	x	x	x	x	x	x	x
D	2002	x				x	x	x	x	no data	no data	no data	no data
BN	2003	x				x	x			x	x		
D	2004					x	x	x	x	x	x	x	x

Discussion

Several factors including Calaveras River hydrology, migration opportunity, salmonid life history, and documented historical presence of these fish in the San Joaquin River and in neighboring drainages of the San Joaquin River Basin lend support to the historical presence of Chinook salmon and steelhead in the Calaveras River. The conclusions of Lindley et al. that several Calaveras River tributaries upstream of New Hogan Dam had summer rearing habitat for anadromous *O. mykiss* and had an historical independent population of steelhead are supported by the collected anecdotal and documented information presented in this study.

Fall observations of salmon in the Calaveras river both upstream of and downstream of Bellota consisted of migrating fall run presumably making their way upstream to spawn. In the post-New Hogan Dam period fall migration presents a special challenge. Fewer overall observations of salmon upstream of Bellota than downstream suggests that in very low water years, fish were less successful in migrating upstream of Bellota even in spring-time when flows typically were higher. In wet springs, more observations occurred upstream of Bellota than downstream. Salmon migrating in fall, even in wet years, appeared less successful in migrating upstream of Bellota than fish migrating in the spring, likely due to downstream barriers and lower fall flows in Mormon Slough leading to stranding. Juvenile fish caught in the spring before 1964 were likely progeny of fall or late-fall run spawners. By the 1990s and 2000s, only fall run have been documented in the river, primarily in Mormon Slough where their upstream migration is stopped by Bellota Weir or other downstream barriers, and lack of flow in the channel. Even though adequate flows may be released from New Hogan Dam, the water is diverted at Bellota, leaving migrating fish dependent on rain run-off or rare storm releases from New Hogan Dam for flows downstream of Bellota Weir. Bellota Weir, located in the valley portion of the Calaveras River, has had a similar impact on salmon and steelhead runs as Woodbridge Dam has had on runs in the Mokelumne River.

Strong evidence suggests late-fall run occurred in the Stanislaus, the Mokelumne, and the Calaveras Rivers. In reviewing historical documentation by Jordan (1892, 1904) of a run in December in the Sacramento and smaller rivers southward Yoshiyama et al. (2000) comment that none of the Central Valley streams south of the Sacramento River had summer flows suitable for winter-run salmon spawning and incubation periods. Therefore, Jordan (1892, 1904) was likely observing a late-fall run in which adult migration and spawning are concentrated in January to April, or, perhaps a very late running segment of the fall run. A late-fall run could also explain the observations of adults in early winter, or December through January on the Calaveras River. Anecdotal observations from the 1930s and 1940s, like those of John Prioli, commonly reported adult salmon in the river during spring, designated as March 1-May 31, and reported spawning in February, March, or April. This pattern corresponds well with the late-fall run life history timing suggested for the San Joaquin River Basin. Although fall-run fish can also migrate in late fall and early winter, the spring spawning period observations argue for late-fall run fish. While water flows occurring after 1964 might have attracted a winter run of salmon into the river and provided spawning and rearing conditions upstream of Bellota Weir, late-fall run fish would likely have been able to take advantage of these migration and spawning conditions, as well. Late-fall run on the Calaveras River may now be extirpated and the run is considered sporadic and not self-sustaining on the Calaveras River (Yoshiyama et al. 2001). The run is not known to have occurred in the Cosumnes and may be extirpated from the Mokelumne.

The percentage of years with average daily spring flows that meet the migration opportunity criteria is slightly higher after New Hogan Dam. Salmon continued to be observed in the Calaveras River in spring until 1966. A remnant spring-run could have persisted in the Calaveras River until the construction of New Hogan Dam as they are thought to have occurred in the Mokelumne River until construction of Camanche Reservoir. Thus, it was likely loss of access to upstream reaches above the dam, rather than a reduction in spring migration opportunity flows, that extirpated spring run from the Calaveras River. While fish were observed migrating or spawning in the spring and early summer in the 1930s, 1940s and 1950s, it is not known if these

fish over-summered in the river or spawned in the fall. Where and when would spring-run on the Calaveras have spawned? There are no collected observations of salmon upstream in the late summer or early fall, August to October, or of adult salmon in pools upstream of Bellota during summer. Spring-time observations of salmon were more likely because more observers reported visiting the river to fish for steelhead or trout in the spring, but did not often frequent the river in summer or fall. Frank Pitto, Calaveras County resident since 1928, fished the river around old Hogan Dam in late summer and early fall when the river had dried up and only disconnected pools remained. He reported fishing the holes for catfish and didn't see salmon. However, it is more likely salmon would have utilized deep summer pools in the canyon downstream, between New Hogan Dam and Jenny Lind, an area difficult for anglers to access. The months August to October are potentially a period when the river would have been composed of disconnected pools and dry reaches. If the spawning period is shifted a month later, as is the case with the fall run, then perhaps the San Joaquin spring-run could have taken advantage of the early fall rains of November to spawn when the river and its major tributaries reconnected and salmon could have dispersed from holding pools to spawning areas, just as trout were reported to do in upstream tributaries.

The fact that trout were fished from Calaveras River tributary streams at similar elevations as steelhead in the Stanislaus River argues that steelhead were likely historically present in the Calaveras river before it was dammed. Steelhead must have taken advantage of winter and spring flows prior to construction of New Hogan Dam to migrate and spawn upstream where they were sought after by anglers. In recent years, steelhead have been documented using winter and spring flows from rain, runoff, and occasional reservoir flood releases, to migrate up the river, though barriers such as Bellota Weir can stop steelhead once flows recede after a storm. Significant obstacles also impede steelhead smolt outmigration in the fall and winter, including low to no flows, barriers in Mormon Slough and the old Calaveras channel where smolts become stranded, and possible entrainment at the unscreened municipal diversion at Bellota Weir.

Conclusion

Early observations and documentation indicate that fall-, late-fall, and possibly spring-run Chinook salmon and steelhead used the Calaveras River prior to 1964 when New Hogan Dam was completed and prior to other earlier flood control and water development projects. After New Hogan Dam construction, steelhead and fall-run salmon and a run occurring in winter, and spawning in spring and early summer (potentially winter-run salmon), have been documented. While a winter run of fish was documented in the river during the 1970s and 1980s, there does not seem to be evidence of that run before the construction of New Hogan Dam.

The timing and amount of flows in the Calaveras River, both before and after New Hogan Dam, provided ample opportunity for anadromous fish to migrate up the river in the fall, winter and spring seasons when they were observed. As in earlier times, storms create fall or early winter flows that attract fish into Mormon Slough. Comparison of salmon observations and flows in Mormon Slough in the late 1990s and early 2000s demonstrates that flows less than 100 cfs can attract fish into the lower river channel and this was likely the case in the past, as well. However, even though the percentage of average daily winter flows that meet the migration opportunity criteria is higher after New Hogan Dam, Bellota Weir and additional newer structures in Mormon Slough make it nearly impossible for fish to take advantage of storms and migrate

upstream unimpeded as they did in the past. After the construction of New Hogan Dam, and subsequent river regulation, such barriers became serious impediments to fish migration, causing stranding when flows high enough to transport fish over the structures drop. New Hogan Dam decreased the percentage of years with average daily flows exceeding 100 and 200 cfs between December 1 and February 28, peak months for late-fall run migration. Additionally, there was a dramatic decrease in the number of dry-year flow peaks over 1000 cfs between the pre- and post-dam periods. However, even the driest water years in the Calaveras River still had flows exceeding 200 cfs in the spring and winter months, enough for fish to migrate and spawn. The combination of instream barriers and fewer high flow events has led to fewer opportunities for salmon to enter the river and move upstream through Mormon Slough to spawning areas upstream of Bellota, even though upstream conditions for spawning were, and are today, adequate. At this point in time, winter and spring flows during non-irrigation season, when most flashboard dams in Mormon Slough are removed (other than Bellota Weir), could still provide opportunity for steelhead and late-fall salmon, and potentially spring-run salmon, to migrate up the river. However, these salmon runs have not been observed in recent years and may be extirpated by now, leaving only the fall run and steelhead available to use the river under the right conditions. The percentage of years with average daily fall flows meeting the migration opportunity criteria increased substantially after New Hogan Dam, but most of this flow does not reach Mormon Slough when fall run arrives in response to flow pulses caused by fall rain storms. Restoring salmonids to the Calaveras River will require improving migration conditions. Migration conditions can be greatly improved by remediating barriers in Mormon Slough so that salmonids can successfully reach upstream spawning and rearing areas during the short periods of high flows occuring after fall and early winter storms and during flood water releases from New Hogan Dam.

Literature Cited

Allen, M.A. and T.J. Hassler. 1986. Species profiles: Life histories and environmental requirements of coastal fishes and invertebrates (Pacific Southwest) – Chinook Salmon. U.S. Fish Wildlife. Serv. Biol. Rep. 82(11-49). U.S. Army Corps of Engineers, TR EL-82-4.26 pp.

Anonymous. 1936 March 13. Stockton Record. Bank of Stockton Archives. Stockton, California.

Baker, P.F. and J.E Morhardt. 2001. Survival of chinook salmon smolts in the Sacramento-San Joaquin Delta and Pacific Ocean. In: Brown, Randall L. (ed). Contributions to the biology of central valley salmonids. Fish Bulletin 179. California Department of Fish and Game. Sacramento, California. Vol.2, 163-182.

Behnke, R.J. 1992. Native trout of Western North America. American Fisheries Society, Bethesda, Maryland.

Bertoldi, G. L., R. H. Johnston, and K.D. Evenson. 1991. Groundwater in the Central Valley, California – A summary report. U.S. Geological Survey Professional Paper 1401-A.

Calaveras River Watershed Stewardship Group. 2005. SEWD Fisheries Reports. Prepared by SP Cramer and Associates. http://www.calaverasriver.com/sewd_fisheries_reports.htm. (4 February 2005).

CALFED Bay-Delta Program. 2000. Ecosystem Restoration Program plan. Volume II: Ecological management zone visions. July 2000. Sacramento, CA.

California Department of Fish and Game (DFG). 1963. Proposed water development on the Calaveras River and tributaries and its effects on fish and wildlife. Region II, Water Projects Branch. Sacramento, CA.

California Department of Fish and Game (DFG). 1972. Report to the California State Water Resources Control Board on effects of the New Melones Project on fish and wildlife resources of the Stanislaus River and Sacramento-San Joaquin Delta. Sacramento, California.

California Department of Fish and Game (DFG). 1979. Calaveras River anadromous fish runs for 1978 to date, a simple chronology of events. Memorandum to file. California Department of Fish and Game, Region 2. Sacramento, CA. March 28, 1979.

California Department of Fish and Game (DFG). 1993. Restoring Central Valley streams; a plan for action. Inland Fisheries Division. Sacramento, CA.

California Department of Fish and Game (DFG). 1996. Calaveras River Chinook salmon study 1996. Maury Fjelstad. California Department of Fish and Game files. Sacramento, CA.

California Department of Fish and Game (DFG). 2001. Contributions to the biology of Central Valley salmonids. Fish Bulletin 179. Volume 1. Randall L. Brown, editor. Sacramento, CA.

Calaveras County Water District (CCWD). 2002. Calaveras River Watershed Management Plan. Phase I. San Andreas, California.

Clark, G. H. 1929. Sacramento-San Joaquin salmon (*Oncorhynchus tshawytscha*) fishery of California. Division of Fish and Game of California, Fish Bulletin No. 17:1-73.

Clark, W.V.T. 1973. The journals of Alfred Doten 1849-1903. Vol. 1. University of Nevada Press, Reno. 808 pp.

Fenenga, F. F. 1969. CA SJO-17: Morman Slough Site. Unpublished manuscript on file at the Western Archeological Center, National Park Service, Tuscon, AZ.

Fisher, F. W. 1994. Past and present status of Central Valley Chinook salmon. Conservation Biology 8: 870-873.

Fishery Foundation of California (FFC). 2002. Stanislaus River salmonid density and distribution survey report (2000-2001). Prepared for The U.S Fish and Wildlife Service Central Valley Project Improvement Act Program. December, 2002. Sacramento, CA.

Fishery Foundation of California (FFC). 2004. Lower Calaveras River Chinook salmon and steelhead limiting factors analysis. First Year Report. Fair Oaks, CA. In preparation.

Fry, D.H., Jr. 1961. King salmon spawning stocks of the California Central Valley, 1940-1959. California Fish and Game 47:55-71.

Gobalet, K.W., P.D. Schulz, T.A. Wake, N. Siefkin. 2004. Archaeological Perspectives on Native American Fisheries of California, with Emphasis on Steelhead and Salmon. Transactions of the American Fisheries Society 133:801–831. In Press.

Goldstein, J.N., D.F. Woodward, and A.M. Faraq. 1999. Movements of adult Chinook salmon during spawning migrations in a metals-contaminated system, Coeur d'Alene River, Idaho. Tran. Amer. Fish. Society. 128(1):121-129.

Gray, R.H. and J.M. Haynes. 1979. Spawning migration of adult Chinook salmon (*Oncorhynchus tshawytscha*) carrying external and internal radio transmitters. J. Fish. Res. Board Can. 36:1060-1064.

Hatton, S.R. 1940. Progress report on the Central Valley fisheries investigations. California Fish and Game 26: 334-373.

Heifetz, J. 1982. use of radio telemetry to study upriver migration of adult river Chinook salmon. M.S. Thesis. Humboldt State University, Arcata, CA. 65 pp.

Jones and Stokes and Associates. 2003. Final Report. Cosumnes River Watershed Inventory and Assessment: Phase II. September 2003. Prepared for Sloughhouse Resource Conservation District and Cosumnes River Task Force. Sacramento, CA.

Jordan, D.S. 1892. Salmon and trout of the Pacific Coast. Pages 44-58 in (12th) Biennial report of the State Board of Fish Commissioners of the State of California, for the years 1891-1892. Sacramento, CA.

Jordan, D.S. 1904. Pacific species of salmon and trout. Pages 75-97 in Appendix to the (18) Bienniel report of the State Board of Fish Commissioners of the State of California, for the years 1903-1904. Sacramento, CA.

Kennedy, T. Email. September 8, 2004. Time it takes for salmon to get to Bellota? Fishery Foundation of California.

Lindley, S.T., R.S. Schick, A. Agrawal, M. Goslin, T.E. Pearson, E. Mora, J.J. Anderson, B. May, S. Green, C. Hanson, A. Low, D. McEwan, R.B. MacFarlane, C. Swanson, and J.G. Williams. 2006. Historical Population Structure of Central Valley Steelhead and its Alteration by Dams. San Francisco Estuary and Watershed Science Vol. 4(1), Article 3.

Maniery, J.G. 1983. A chronicle of Murphys Rancheria (Mol-Pee-So): an historic Central Sierra Miwok village. Journal of California and Great Basin Anthropology 5: 176-198.

Meehan, W.R. and T.C. Bjornn. 1991. Salmonid distributions and life histories. Pages 47-82 *in* W.R. Meehan, editor. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publications No. 19, Bethesda, Maryland.

Morgan, D.L. 1970. In pursuit of the golden dream. Reminiscences of San Francisco and the northern and southern mines, 1849-1857, by Howard C. Gardiner. Western Hemisphere, Inc., Stoughton, Massachusetts. 390 pp.

Mount, J., G.E. Fogg, L. Kavvas. 2001. Linked surface water-groundwater model for the Cosumnes River watershed: hydrologic evaluation of management options to restore fall flows. USFWS Anadromous Fish Restoration Program. Cooperative Agreement No. 11332-8-5264.

Skinner, J.E. 1958. Some observations regarding the King salmon runs of the Central Valley. California Department of Fish and Game. Water projects miscellaneous report #1 (File report). Sacramento, CA.

Smith, D. R. 1976. From Stage Stop to Friendly Community- A History of Linden. Society of Odd Fellows Lodge Number 102. Linden Publications, Linden CA.

Sullivan, M.S. 1934. The travels of Jedediah Smith. A documentary outline including the journal of the great American pathfinder. The Fine Arts Press, Santa Ana, California. 195 pp.

Tinkham, G.H. 1880. A History of Stockton. W.M. Horton and Company, San Francisco, CA.

Turlock Irrigation District-Modesto Irrigation District (TID/MID). 2002. 2001 Lower Tuolumne River Annual Report. Volume 1. Report to the U.S. Federal Energy Regualtory Commission. Project No. 2299. Turlock, CA.

United States Army Corps of Engineers (USACE). 1981. Reconnaissance Report, New Hogan Fishery Investigation. USACE, Sacramento District, CA.

United States Bureau of Reclamation (USBR). 2000. Cosumnes River Salmonid Barrier Improvement Project Environmental Assessment/Initial Study and Draft Finding of No Significant Impact. Cosumnes River Salmonid Barrier Improvement Project. Prepared by Fishery Foundation of California. Concord, CA.

United States Fish and Wildlife Service (USFWS). 1993. Memorandum from W. S. White to David Lewis, Regional Director, Bureau of Reclamation, Sacramento, California. USBR - Stanislaus River Basin Calaveras River Conjuctive Use Water Program Study; a preliminary evaluation of fish and wildlife impacts with emphasis on water needs of the Calaveras River. January 28, 1993. Sacramento Field Office, Sacramento, California.

United States Fish and Wildlife Service (USFWS). 1995. Working Paper on Restoration Needs. Habitat restoration actions to double natural production of anadromous fish in the Central Valley of California. Volume 2. Anadromous Fish Restoration Program. Sacramento, CA.

United States Fish and Wildlife Service (USFWS). 1998. Central Valley Project Improvement Act Tributary Production Enhancement Report. U.S. Fish and Wildlife Service. Central Valley Fish and Wildlife Restoration Program Office. Sacramento, CA.

Warner, G. 1991. Remember the San Joaquin. In: *California's salmon and steelhead. The struggle to restore an imperiled resource*. (Ed. A. Lufkin), pp. 61-69. University of California Press. Berkeley, CA.

Yoshiyama, R.M., F.W. Fisher and P.B. Moyle. 1998. Historical abundance and decline of Chinook salmon in the Central Valley region of California. North American Journal of Fisheries Management 18:487-521.

Yoshiyama, R.M., E.R.Gerstung, F.W. Fisher, and P.B. Moyle. 2000. Chinook salmon in the California Central Valley: an assessment. Fisheries: vol. 25: no. 2. pp. 6-20.

Yoshiyama, R.M., E.R.Gerstung, F.W. Fisher, and P.B. Moyle. 2001. Historical and present distribution of Chinook salmon in the Central Valley drainage of California. California Department of Fish and Game Fish Bulletin 179(1):71-176.

Appendix A

Table A1. Salmon Observations by Year, Season, Location, Water Year Type and Source.

Table A2. – Anecdotal Sources – Interview Transcripts

Bibliography - Documented Sources

Table A1. Salmon Observations by Year, Season, Location, Water Year Type and Source.

Footnote Number	Year observed	Season	Location	WY type	Source
1	1930s (1930-39)	Fall	MS - Solari Grocery	W, AN, C, D	Anecdotal (F. Solari)
2	1930-39	Spring	MS -Bellota	W, AN, C, D	Anecdotal (F. Day)
3	1930-39	Spring	C - Jenny Lind Bridge	W, AN, C, D	Anecdotal (F. Day)
4	1930-39	March, April	C - at old Hogan Dam	W, AN, C, D	Anecdotal (F. Day)
5	1930-39	Spring	C - upstream of old Hogan Dam	W, AN, C, D	Anecdotal (F. Day)
6	1930-39	Spring	C - spawning at Calaveras River Park downstream of old Hogan Dam	W, AN, C, D	Anecdotal (F. Day)
7	1940s (1940-49)	Fall	MS - Solari Grocery	W, AN, BN, D	Anecdotal (F. Solari)
8, 10	1940s, early (1940-1944)	Nov - Jan	C - gold dredged area (5 mile reach downstream of canyon)	W, AN, BN	Anecdotal (J. Prioli)
9, 11	1940s, late (1947-1949)	Late fall/early winter	C - Just downstream of Hogan Dam	D, BN	Anecdotal (J. Prioli)
12	1940-44	Spring	MS -Bellota	W, AN, BN	Anecdotal (F. Day)
13	1940-44	Spring	C - Jenny Lind Bridge	W, AN, BN	Anecdotal (F. Day)
14	1945 to 1949	Feb, March, April	C - Jenny Lind bridge	AN, BN, D	Anecdotal (J. Prioli)
15	1940-44	March, April	C - at old Hogan Dam	W, AN, BN	Anecdotal (F. Day)
16	1940-44	Spring	C - upstream of old Hogan Dam	W, AN, BN	Anecdotal (F. Day)
17	1945 to 1949	Feb, March, April	C - see spawning at Mallard Bend, a wide bend in river downstream of Jenny Lind Bridge	AN, BN, D	Anecdotal (J. Prioli)
18	1940-44	Spring	C - spawning at Calaveras River Park downstream of old Hogan Dam	W, AN, BN	Anecdotal (F. Day)

Footnote Number	Year observed	Season	Location	WY type	Source
19	1949	Fall	C - upstream of Jenny Lind	BN	Anecdotal (J. Prioli)
20	1949	Spring	Old C - juveniles behind UOP campus	BN	Anecdotal (J. Prioli)
21	1950	Spring	Old C - juveniles behind UOP campus	BN	Anecdotal (J. Prioli)
22	1955	March	MS - RR trestle at Potter Creek	D	Anecdotal (R. Schenone)
23	1960	Spring	MS- Bellota	C	Anecdotal (M. Machado)
24	1960s	Fall	MS - Solari Grocery	W, AN, BN, D, C	Anecdotal (F. Solari)
25	1960s	Fall	C - between Shelton and Bellota	W, AN, BN, D, C	Anecdotal (F. Solari)
26	1960s	Fall	MS -Between Fine and Flood Roads, spawning	W, AN, BN, D, C	Anecdotal (F. Solari)
27	1966	Spring	C - between Valley Springs and Stockton	BN	Anecdotal (B. Cudney)
28	1972	March	SDC, 1 mile east of Jack Tone Rd. Fish rescue.	D	DFG 1974b, 1975c; Anonymous 1972
29	1972	March	MS - Jack Tone Road crossing	D	Anecdotal (R. Schenone)
30, 31	1972	April - May	C - spawning reported, unknown location	D	Anecdotal reported by DFG 1975c
32	1973	Spring	C - upstream of Jenny Lind	AN	Anecdotal (J. Andrews)
33	1973	April	Downstream of Bellota - large juvenile downstream migrants stranded and killed after dams erected.	AN	DFG 1975c
34	1974	Spring	C - upstream of Jenny Lind	W	Anecdotal (J. Andrews)
35	1974	Spring	C - New Hogan Dam Road	W	Anecdotal (B. Andahl)

Footnote Number	Year observed	Season	Location	WY type	Source
36	1974	April	C – yearling downstream of NHD	W	DFG 1974a
37	1975	January	SDC - adults stranded downstream hwy 99	W	DFG 1975c, 1978a
38	1975	January	MS - Bellota	W	DFG 1975c
39	1975	Spring	C - upstream of Jenny Lind	W	Anecdotal (J. Andrews)
40	1975	April	C - adults stranded in Cosgrove Creek	W	DFG 1975d
41	1975	April	C - downstream of NHD	W	DFG 1975b, 1978a
42	1975	June	C - holding in pool downstream of NHD	W	DFG 1975a, 1978a
43, 44	1975	April - July	C- spawning downstream of NHD to 2 miles downstream	W	DFG 1975d
45	1976	Feb	C - entering river	C	DFG 1976, 1978b
46	1976	Spring	C – upstream of Jenny Lind	C	Anecdotal (J. Andrews; J. Sorenson)
47	1976	April	C - rescue of salmon just east of UOP campus	C	Anecdotal (J. Sorenson)
48	1976	April	Old C – downstream of lowest dams, fish rescue	C	DFG 1978b
49	1977	Feb	C – yearling upstream of Jenny Lind	C	USFWS 1989
50	1977	March or April	MS – at lower most dams	C	DFG 1979b
51	1978	early January	C - lower reaches of the river downstream of Bellota	W	DFG 1978c
52	1978	early February	C - lower reaches of the river downstream of	W	DFG 1978c

Footnote Number	Year observed	Season	Location	WY type	Source
			Bellota		
53	1978	March	MS - Bellota	W	DFG 1979a, 1980
54	1978	April	MS - Bellota	W	Anedotal (J. Raine)
55	1979	March - April	MS - Bellota	AN	DFG 1979a
56	1982	Spring	MS - Bellota	W	DFG 1986
57	1982	Spring	C - downstream of NHD	W	DFG 1982, 1986
58	1984	April	C - downstream of NHD; unspawned winter run	AN	DFG 1984
59	1987	June	C - yearling caught upstream of Bellota	C	USFWS 1989, 1993
60	1995	November	MS – Bellota. Fish rescue.	W	Anecdotal (M. Bane); Nickles 1995 Nov 4 & 7
61	1995	Fall	C- canyon near Jenny Lind	W	Anecdotal (L. LeBeouf quoted in Nickles 1996 March 4); Koscho 1995 Nov 7
62	1995	Spring	Old C - smolt behind UOP	W	Anecdotal (T. Taylor)
63	1996	Feb - June	C- juveniles between NHD and Bellota	W	DFG 1996
64, 66	1997	Fall	MS -Between Fine and Flood Roads; observed salmon trying to spawn	W	Anecdotal (F. Solari)
65	1997	Fall	MS - Bellota	W	Anecdotal (F. Solari)
67	1998	late October or early November	MS - Bellota	W	Nickles 1998 Nov 3; Anecdotal (M. Machado)
68	1998	October	SDC	W	Nickles 1998 Oct 17
69	1998	October	MS - Piazza Dam	W	Nickles 1998 Oct 17
70	2000	Fall	C - between Shelton and old gravel plant	AN	Anecdotal (F. Solari)
71	2001	November	SDC	D	DWR 2003, FFC 2004
72	2001	December	Mormon Slough - stranded	D	DWR 2003, FFC 2004

Footnote Number	Year observed	Season	Location	WY type	Source
73, 74	2001	December	MS - spawning observed downstream of Bellota	D	DWR 2003, FFC 2004
75	2002	November	SDC	D	DWR 2003, FFC 2004
76, 77	2002	December	MS – downstream of Bellota; spawning observed	D	DWR 2003, FFC 2004
78	2003	November	SDC	BN	FFC unpublished data
79, 80	2003	December	Near tidewater, West Ave., and MS	BN	FFC unpublished data
81, 82	2004	January	MS and Bellota	D	FFC unpublished data
83	2004	February	MS	D	FFC unpublished data
84	2004	November	Downstream of confluence with SDC	D	FFC unpublished data
85, 86, 87	2004	December	Downstream of confluence with SDC, Old C, and SDC	D	FFC unpublished data

MS = Mormon Slough; C = Calaveras River; Old C = old Calaveras channel;
SDC = Stockton Diverting Canal; NHD = Hew Hogan Dam

Table A2. Anecdotal Sources – Interview Transcripts

Date	Name	Residence	Remarks
Feb 2002 & May 2, 2002	Fred Solari	Stockton	In the 1930s and 1940s Fred's dad caught salmon across the street from the old Solari grocery in the old Mormon Slough. Locals would shoot or spear them in the slough. Fred says this was in the fall. In the 1960s, Fred said as kids they caught salmon by the store as well. Also, during the 1960s he caught salmon and steelhead in the Calaveras River upstream of Bellota. They would float from Shelton Road. to Bellota/Escalon Rd. Once he caught a trout larger than a 50-quart cooler. He once caught a 40 lb. salmon in Mormon Slough in the 1960's. Fred recalls Mormon Slough prior to modification in the late 1960s. In 1967 they used to float from Shelton Rd to the gravel pits. There was a 'cliff' and the 'big hole" on his dad's property between Highway 26 and Flood Rd. The channel was deeper with cliffs opening into a cave and a deep hole. No one knew how far the cave went into the bank. But, when the river dried up, this cave disappeared. It took months for the 'hole' to dry up; it was 20-30 feet deep. This was all between Fine and Flood Rds. They would catch perch from the hole. They swam in the pools in Mormon Slough and would try to catch salmon by hand. Doesn't recall what season of year this was. Could have been fall or spring if it was warm enough. (He personally had only done this once with his friends). They'd catch salmon up to Escalon Bellota Rd. It was rainier in the 1950s and 1960s, lots of fish. After the 70's drought-no fish. He used to catch his limit of trout, small mouth bass up to 21". There used to be otter in the river by Bellota, but hasn't seen one since 1988. In Fall 1983 or 1984, he caught a salmon that didn't look like a chinook; it had a big hooked jaw and the eyes were different, skin was red. His cousin caught a Chinook at the same time. The fish looked different from each other. Couldn't catch any kind of fish (carp, pike minnow, perch, catfish, for example) from 1988-1993 during the drought. Because there was no water in the river. After that drought ended, started catching trout again. For example, in 1997, the Stockton Record reported a big run of salmon. There were hundreds of salmon and steelhead at Fine Rd. Bridge. He saw a salmon over 5 feet long. Found a dead male 37" long. Could see the salmon trying to spawn between Fine and Flood Rd. The newspaper reported only 13-17 caught at Bellota. The paper missed the story- there were many more than that. Fred has only seen salmon in the fall, never seen the spring-run that has been reported. Then in spring 1998, he caught two 18"steelhead between Fine Rd. at Avisino Dam. Beneath Fine Rd. Bridge, he saw 1,000s of 3" juvenile fish (shade of blue with red spots on side, like a rapala bait). Approximately 2 years ago, he caught a jack salmon between Shelton Rd. and old gravel plant. Identified by Stockton DFG office on Wilson Way. Wasn't until last year (2001) that he started catching 4-5" trout again. In October 2001 he caught and released 35 trout from 8" –18"long between Shelton Rd. and Bellota. He caught one at 24". He identified 3 kinds of trout. One that is lime green and beautiful, one solid silver with black spots (he thinks these are steelhead), one bluish with red and black spots.
2/22/02 & 5/3/02	Ray Shenone	Stockton,	In the 1950's Calaveras County was able to keep more water and less water went down to tide water in the diverting canal. At this time, there were no dams, no Bellota Weir. The fish came up with the floods, but most people didn't know they were there. You couldn't see them because they moved right through. However, one time in March 1955, while visiting a relative's farm, he and his cousins and brothers found 2-3 hundred salmon stacked up downstream of the railroad bridge at Potter Creek on Mormon Slough. At that time large boulders and riprap had

Date	Name	Residence	Remarks
			been placed in the channel to protect the bridge. This blocked the salmon, which were in a deep pool. They shot and speared some of the salmon. This was the 1st time Ray had seen so many salmon and he was so impressed he has been interested in salmon ever since. Ray recalls, once, the creeks along hwy 99 and French Camp road flooded and salmon were found in the fields. The salmon had gone up the creeks and into the ditches. Ray pointed out Robert Lavajji's old place along Mormon Slough. Robert caught trout, salmon, and steelhead from his property just downstream of Jack Tone Rd. In March 1972, Ray caught salmon at the jack tone Rd. Bridge. In 1975 his son and cousin were fishing for black bass in the gravel pits upstream of Bellota. They hooked very strong fish that weren't bass. They thought the fish were steelhead though they weren't able to land one. When SEWD was formed, the diverting canal and Mormon Slough were modified, and the dams were put in so farmers could use surface water for irrigation instead of ground water. Prior to modifications in the late 1960's Mormon Slough was wild with deep pools, tree lined banks, water falls over hard pan drops. Now examples of what it used to look like (minus trees) are at Duncan Rd Bridge looking upstream, and Fine Rd. Bridge. The hard pan channel near Jack Tone Rd. used to be an area of deep pools but they were eliminated. Ray thinks keeping the dams in for recharge and putting tunnels through the bottom boards for adults would provide good passage for adult salmon. The deeper water will provide cover for the fish, like before.
2/20/02 & 5/3/02	John Prioli	Stockton	As a teenager, hunted and fished around Jenny Lind from 1945. Fished for bass. Tried to snag salmon and steelhead when he saw them downstream of the bridge in Feb., March, and April. Would see salmon spawning downstream in the wide bend in the river (Mallard Bend). In 1949-50 John took a bio class at Delta College; they would rescue salmon fingerlings right behind UOP. The juvenile salmon par were stranded in the pools left behind by receding water; they netted them and put them back in main channel. Instructor identified the fish for them. Once, for a biology class project in the fall of 1949 he tried to sample for lamprey eels upstream of Jenny Lind but didn't find any. However, he recalls seeing adult salmon at that time. In the late 1940s he heard about people panning for gold just downstream of New Hogan Dam and they saw salmon and steelhead there. During that period of time, he can't recall a spring when he didn't see juveniles. In 1949 and 1950 there were parr both years. In our first interview John said that in Feb., March, and April he would fish for bass every week and see adults (either salmon or steelhead). In our second interview, John said he fished for black bass in the spring and they would try to snag what they thought were salmon or steelhead in the deep ponds. They couldn't really see the fish, so not sure which they were. As a youngster, he walked the gold dredged areas up stream to hunt ducks in November – January; John reports having seen salmon and steelhead in the main channel.
2/20/02 & 5/3/02	Frank Pitto	San Andreas	Resident of County since 1928. Around 1935-36 he fished on the Calaveras just downstream of old Hogan Dam. In summer time the river dried up. Only pools remained and they contained catfish. He fished behind the dam, which was very muddy, with little water flowing into the reservoir. His whole family would picnic July 4th upstream of the dam and swim in the murky water. They usually fished in late summer/fall when the river would only be 'pools'. They just liked to fish the holes for catfish. In the Fall he fished near Comanche on the Mokelumne, and remembers salmon there in mid October, making it to Comanche. But there were no salmon on the Calaveras. After the New Hogan Dam was built, that's when salmon fishing was made possible in the Calaveras. He worked on the construction of New Hogan Dam. Frank said they didn't go down along Mormon Slough ever, so he

Date	Name	Residence	Remarks
			had no knowledge of the fish down there.
2/28/02 & 5/7/02	Jay Sorenson	Stockton	Jay coordinated a salmon rescue just east of the UOP campus and the railroad tracks in April 1976. During the same operation he also helped move salmon over Bellota Weir and the Van Allen Road weir. He counted 546 salmon. It was raining that day. Beaver Chemical had released effluent into the sewer and it went into the Calaveras River where he had 5 or 6 salmon cornered for netting. The effluent came out of an outlet right there and immediately killed the salmon they were tyring to net. Later, after the rescue, residents upstream reported seeing salmon spawning on the gravel beds near Jenny Lind. In 1995 he helped put in the Denile ladder at Bellota. Jay has been a fishing guide in the Delta his whole life. Has never fished on the Calaveras.
2/20/02	Doug Codog	Stockton	Doug brought to our attention an archeological report of a midden site on Mormon Slough containing salmon spear artifacts. Archeology paper written by Fenenga, Franklin F. 1969 CA-SJO-17: Morman Slough Site. Unpublished manuscript on file at the Western Archeological Center, National Park Service, Tuscon, Arizona. It was done for the Army Corps of Engineers by Long Beach College (now CSU, Long Beach). The whereabouts of this paper was determined by Janis Offerman, CA Department of Water Resources.
3/11/02 & 5/3/02	Maisi Schachten	Murphys	Maisi will be 85 years old in July. Her deceased husband, Lenwood, was born and reared in Murphys, California. He fished the Stanislaus with local Indian friends. His dad fished the river, too, in the late 1800s. The family fished upstream of Murphys. They never caught a salmon, but caught steelhead. She recalls her husband's stories of coming up from the river with baskets full of steelhead trout. This was over 50 years ago, fishing with his brother and father. Maisi has fished, too. She fished for salmon three different years in Alaska; so she knows what salmon look like. She said her 52-year-old son, Tom Schachten, has fished all the local streams, and probably the Calaveras, too. He'll be back in June. We should contact him for stories. He used to own Glory Hole sports in Angels Camp before New Melones was built. He had to close the shop because the river “dried up” when they were filling New Melones reservoir. He now lives and fishes in Idaho. Maisi taught her kids how to fish across the street from their home in Murphys creek; they caught trout, but no steelhead in that creek. She referred me to her sister-in-law, Lois Ostrowski, for more stories. Maisi said she would mail me some pictures. (as of 5/3/02, she said she hadn’t located any pictures yet.)
03/11/02 & 5/3/02	Lois Schachten Ostrowski	Murphys	Lois is 92 years old and she was born and raised in Murphys. Her father was raised in Valley Springs area on Haupt Creek. His mother ran a roadhouse; no family members reside in that area now. She didn't fish, but her husband, father, sons did. In her father's day, they made their own hooks. She does recall family members having fished the Calaveras River. The names Jenny Lind and Valley Spring were familiar to her as places where they might have fished, but she couldn't recall exactly where. She recalled that they caught steelhead in the Calaveras, but never saw or heard of people catching salmon. She thinks (conferred on this with her adult nephew who was in the room with her during our conversation) that this was usually in the spring, the month of May, when they'd get steelhead. I asked her how they knew it was steelhead. Lois said the fishermen knew the differences between steelhead, trout (brown and other trout), and whether it was a planted or wild fish from experience and taste. She said that they would regularly get “salmon bellies” in a salt barrel from down in the valley towns (couldn't remember name of

Date	Name	Residence	Remarks
			town). These were wine barrels full of fresh salted salmon filets. They bought dried cod fish this way, too. They'd make creamed salmon to pour over rice or noodles. Lois' point was that if they had been able to catch salmon in the river where they lived, they wouldn't have bothered to obtain salmon from town. She has no pictures.
01/28/02 &5/3/02	Marilyn Bane	Valley Springs	Marilyn's husband, George Bane (now deceased), was one of the original salesman for the Rancho Calaveras subdivision. The Bane's home is on Dunn Road, just above the river. They had owned the property for many years while living in the Bay Area. Built a home and moved to the property when they retired. Mrs. Bane continues to live there now. In the early 1960's her husband used to come up from the Bay Area with friends to fish upstream of Jenny Lind. They fished for trout but she doesn't recall what season of year. They would walk a path above the river. One time they watched fishermen catching fish from a deep hole upstream from their property that were as "long as a man's leg." She is uncertain if these fish were salmon or steelhead, but they were not trout as they were much too big. Her grandson, daughter and son-in-law still catch 17"-18" trout from the river on her property. She does not have pictures. Mrs. Bane also related a story about a group of people at the Bellota Weir helping salmon and/or steelhead over the weir. She is certain this took place in November 1995, as she was celebrating her 50th wedding anniversary at the time.
02/05/02 & 5/3/02	Brian Cudney	Valley Springs	Mr. Cudney remembers catching a salmon in the Calaveras River when he was six years of age somewhere. He caught it between Valley Springs and Stockton in approximately 1966. He thinks it was spring because he recalls school was almost out. He had the fish over his shoulder, tail dragging on the ground. He estimates the weight at 20#. At that time there was more water in the Calaveras, enough to float a boat from the dam down to the Jenny Lind bridge. He said his dad used to leave him fishing at the Jenny Lind bridge on Milton Road, then go upriver to just downstream of the dam and put the boat in. Then his dad would float down the river fishing and hunting wood ducks until he reached the bridge to pick Brian up. This would have been in the fall/winter. The grass was green, there were turkeys and frogs. They weren't wearing shorts or t-shirts. Brian remembers catching steelhead (they were big and had red throats) ranging from four to seven pounds at the Jenny Lind bridge in the 60's and 70's. Brian also remembers the salmon run Mrs. Bane mentioned at the Bellota Weir, estimating the date at 1993 - 1995. He says he stopped fishing from the Jenny Lind bridge somewhere around 1975-1978 when the road department put up "No Trespassing" signs. He stopped by Bellota weir several times in fall 2001 to keep his eye out for salmon, but didn't see any fish getting over the weir that fall. Brian caught trout upstream of New Hogan reservoir by the cement plant (the plant was/is on Pool Station Rd out of San Andreas). He says logging in the upper reaches upstream of New Hogan has damaged streams so that fishing for trout is poorer now. He also recalls having caught fish (doesn't recall what kind) in the pools of a tributary

Date	Name	Residence	Remarks
			stream that flowed through a golf course into a tributary of the Calaveras that flowed into the Calaveras downstream of the dam.
02/05/02 & 5/7/02	Jeff Andrews	San Andreas	Jeff is a Calaveras Public Utility District Employee (San Andreas' water purveyor). He has lived in Calaveras County since he was a teenager. He fished the Calaveras River as a teenager for four years. His family was new to the area and Jim Martin of Jim Martin Reality told them about where to go fishing in the Rancho Calaveras Subdivision (this is 1/5 miles downstream of New Hogan Dam) before the subdivision began development in the late 70s. After the houses went in, they couldn't get to the fishing access anymore. They drove down Hogan Dam Rd or Silver Rapids Rd, parked, hiked down the hill and down the river for ½ hour to get to their fishing spot. They fished in late April at the opening of trout season, and fished for rainbow trout. Biggest one they caught was 16". He recalls seeing salmon runs in the mid 1970's four years in a row between New Hogan Dam and Jenny Lind where they fished. The fish were very large, scarred and beat up and were present during the opening of trout season in the spring. They saw another angler catch a 36" salmon that was fresh and still had good color. Jeff also sometimes went fishing for trout upstream of New Hogan Dam before the striped bass wiped out the trout fishing. Now, the trout fishing is pretty much over upstream of the reservoir.
2/14/02	Brandt Andahl	Valley Springs	Mr. Andahl has lived in Calaveras County all his life. He recalls seeing salmon up to 3 feet in length under the bridge at Hogan Dam Road and Silver Rapids Road just downstream of New Hogan Dam in the early 1970's. He estimates the year to be 1973 or 1974. The salmon were there in the spring, and they were very banged up and rough looking. He only recalls seeing them that one time, but says at the time he was not an avid fisherman and so did not really go looking again. Mr. Andahl also mentioned that he has recently (within the last year) been fishing on the Calaveras upstream of New Hogan reservoir, up near the old cement plant. This area is popular with local trout fishermen. He said he was surprised to find a striped bass carcass on the bank of the river up there. New Hogan is populated with striped bass, and they have eaten all the trout in the lake. But as a rule, the stripers stay in the lake and do not come upstream.
2/20/02	Fred "Bud" Day	Altaville	Mr. Day is a 91-year-old Calaveras County native. He was part of the crew that built the original concrete Hogan Dam during 1927, 1928 and 1929. It was built for flood control purposes. His father worked for the City of Stockton in the 1920s and oversaw the old Hogan dam construction and operations. Fred Day (the son) worked at the dam for 14 years from 1930-1944. He and his parents lived at the dam. There was a bunkhouse for the men who operated the dam; his mother was the cook and his dad was the manager. One of the maintenance jobs was 'corking' the seams in the concrete dam with lead 'wool'; Fred Day was one of the men who was let down on a rope along the face of the dam to place the 'wool' in the seams. Mr. Day was working at the dam about 4-5 years after it was completed and recalls the water flows being extremely heavy during spring-runoff (he says he it was in the early 1930s but is not sure of the exact year). Mr. Day was employed pumping cement into forms at the dam for the purpose of grouting the dam to seal cracks. The winter weather had been severe and there was considerable snowmelt, which produced a very heavy flow of water. It was March or April and it had been raining for 2-3 days. Water had overtopped the diverting canal in Stockton and water had almost reached hwy 26 at Linden. Mr. Day was on his way back up to the dam from Stockton where he

Date	Name	Residence	Remarks
			had been picking up some material. He had to beat the water before it covered the road. He drove past Solari store, past Bellota to where the road goes past Duck Creek. There he saw a car stuck on the road covered up to its roof by water. He had to turn around, backtrack to the store and take an alternate route through Clements to reach the dam. On his way he noted that Valley Springs/Larson Flat were flooded by Lime Creek. Lime Creek flows into Silver Rapids which flows into the Calaveras River. The water was so high behind the dam that all nine holes through the dam were gushing full-time, and water covered the bridge and the cattle fencing all around the river. He described a 3-feet wide catwalk at the bottom of the dam where 8" valves were located. He, his brother and cousin (they all worked at the dam) saw lots of salmon trying to come through the holes in the dam, some falling down the face of the dam, some whacking the valves as they fell. He said the salmon fell across the 3-feet wide catwalk and were longer than the catwalk was wide. The salmon leapt at the water gushing out of the holes; some of them made it through to the upstream side of the dam. Later that spring or early summer, Mr. Day said he walked upstream of the dam after all the water had gone down and large sand flats were left behind. He found salmon skulls with the big hooked jaws up there. Mr. Day recalls that he saw salmon in the Calaveras downstream of the dam most every spring when the water flows were high. The wet years were when he saw the most salmon. Mr. Day said that when he was 13 or 14 years old, this would have been in the mid 1920's, there was substantial water flow in all the streams in Calaveras County, and the winter weather was severe, very wet, very snowy, compared to the present. He does not recall ever seeing a fall run of salmon, which he said would not have been possible most years anyway because there was not enough water in the fall to support the fish coming up the river. In addition, there was a spot upstream of the dam (now located at the upstream end of the current reservoir at North Branch Rd.) called 'the falls' where he believes fish may have not been able to get past. He said these falls were later blasted when the new reservoir was completed to allow fish to migrate out of the reservoir to spawn in the upstream areas. He saw salmon many times downstream of the old "Jenny Lind" bridge, which spanned the Calaveras and went to the town of Milton. He said fish 3' long were common there. Mr. Day also caught steelhead from the old bridge. Salmon were seen regularly at Calaveras River Park, approximately 100-200 yards downstream of the dam, in a large swimming hole that probably measured 70-80 feet across. He and his wife would catch steelhead in this pool in spring and early summer. He says the salmon spawned there at the swimming hole. One of Mr. Day's jobs was to maintain the rain guage near Bellota near the road to Farmington. He changed the paper in it each Saturday and he'd see salmon at Bellota when they were there. As a boy, he fished the local tributary streams for trout; these were Jesus Maria, O'Neill Creek, Murray Creek and others. He said he figures he caught trout in nearly every stream in this county when he was a boy. He caught nice big trout and indicated with his hands they were around 14'' long or longer. Mr. Day also fished the Calaveras upstream of Hogan Reservoir, and recalls finding skeletons of salmon ("big, hooked jaws") upstream of San Andreas in an area known as "The Narrows." I (G. Marsh) asked Mr. Day if he recalled people talking about the fish they caught when he was a boy. He said he didn't recall people fishing for steelhead or salmon; but people regulary fished catfish in the spring and mostly in

Date	Name	Residence	Remarks
			the Calaveras. For some reason in the spring, the catfish would come up the river and they would be in the eddies and margins along the banks after a rain. One time his sister, brother-in-law, wife and he filled a wash tub full of catfish using cane poles and a short bit of line. A local resident living downstream of the dam, a Swede named Anderson, caught catfish and he heard Mr. Anderson talk about that. Mr. Day was born and raised in Mountain Ranch near a body of water he referred to as Emery Reservoir. The reservoir was named for a senator who apparently provided funds for the construction. The reservoir supplied water to hydraulic miners near Fricot City where the senator may have had a mining interest. His father and Uncle were hydraulic gold miners at the turn of the century at Cave City on McKinney Creek/Emery Reservoir (which he said may be O'Neill Creek, and referred to the headwaters of the creek being in Camp Connell). His dad and uncle planted steelhead trout in Emery Reservoir and fished for them regularly there. In 1911, the dam that held Emery Reservoir broke and he recalls that his father told him that dam failure raised the water level in Bellota by 6 feet. Mr. Day says that those planted trout went downstream with the water flows from the broken dam in 1911. The dam broke again in 1919.
July 29 2002	Mike Machado	Stockton	Recalls seeing salmon at Bellota when he was 12 years old in the spring in 1960, and at Bellota in 1998. No season provided in 1998, but based on other reports assumed to be in the fall.
January 6, 2003	Tom Taylor	Stockton	Tom watched a young salmon behind UOP at a pedestrian bridge. He recalls this was approximately spring of 1995. He watched the salmon smolt moving through a pool, being chased by bass. The smolt leapt out of the water onto the sand bank. Tom went down and shoved it back into the water. He said the smolt was around 90-100 mm. He said bass were all over in the tidal reach of the river.

Bibliography - Documented Sources

Anonymous. 1972 March 20. Rescue operation aids Calaveras Salmon Run. Stockton Record; A:1.

California Department of Fish and Game (DFG). 1974a. Creel census below Hogan Dam. Memorandum to file. California Department of Fish and Game, Region 2. Sacramento, CA. May 7, 1974.

California Department of Fish and Game (DFG). 1974b. King (Chinook) salmon spawning stocks in California's Central Valley, 1972. Administrative Report No. 74-6. Sacramento, CA.

California Department of Fish and Game (DFG). 1975a. Scuba survey below Hogan Dam. Memorandum to file. California Department of Fish and Game, Region 2. Sacramento, CA. June 11, 1975.

California Department of Fish and Game (DFG). 1975b. Creel census below Hogan Dam. Memorandum to file. California Department of Fish and Game, Region 2. Sacramento, CA. June 11, 1975.

California Department of Fish and Game (DFG). 1975c. Memo from Robert W. Lassen to Chief of Operations regarding need for fishways and improved water flow in the Calaveras River below New Hogan reservoir. California Department of Fish and Game, Region 2. Sacramento, CA. March 18, 1975.

California Department of Fish and Game (DFG). 1975d. Observations of King Salmon spawning activity. Memorandum to file. California Department of Fish and Game, Region 2. Sacramento, CA. May 13, 1975.

California Department of Fish and Game (DFG). 1976. Letter from R. W. Lassen to Robert Sagehorn, General Manager, Stockton East Water District. California Department of Fish and Game, Region 2. Sacramento, CA. March 11, 1976.

California Department of Fish and Game (DFG). 1978a. King (Chinook) salmon spawning stocks in California's Central Valley, 1975. Administrative Report No. 77-12. Sacramento, CA.

California Department of Fish and Game (DFG). 1978b. King (Chinook) salmon spawning stocks in California's Central Valley, 1976. Administrative Report No. 78-19. Sacramento, CA.

California Department of Fish and Game (DFG). 1978c. Memo from R. D. Beland to Robert W. Lassen, Regional Manager, Region 2, DFG. Current status of Calaveras River King Salmon run and proposed contingency plans for rescue operations. California Department of Fish and Game, Region 2. Sacramento, CA. February 15, 1978.

California Department of Fish and Game (DFG). 1979a. Calaveras River anadromous fish runs for 1978 to date, a simple chronology of events. Memorandum to file. California Department of Fish and Game, Region 2. Sacramento, CA. March 28, 1979.

California Department of Fish and Game (DFG). 1979b. King (Chinook) salmon spawning stocks in California's Central Valley, 1977. Administrative Report No. 79-11. Sacramento, CA.

California Department of Fish and Game (DFG). 1980. King (Chinook) salmon spawning stocks in California's Central Valley, 1978. Administrative Report No. 80-6. Sacramento, CA.

California Department of Fish and Game (DFG). 1982. Seine survey of Calaveras River below New Hogan Dam. Memorandum to file. California Department of Fish and Game, Region 2. Sacramento, CA. July 21, 1982.

California Department of Fish and Game (DFG). 1984. Calaveras River fishery below New Hogan Dam. Memorandum to file. California Department of Fish and Game, Region 2. Sacramento, CA. May 1, 1984.

California Department of Fish and Game (DFG). 1986. Annual Report Chinook salmon spawning stocks in California's Central Valley, 1982. Administrative Report No. 84-10. Sacramento, CA.

California Department of Fish and Game (DFG). 1996. Calaveras River Chinook Salmon study 1996. Prepared by Maury Fjelstad. Unpublished report. California Department of Fish and Game, Region 2. Sacramento, CA.

California Department of Water Resources (DWR). 2003. Evaluation of in-stream structures and fish passage on the Calaveras River. Draft. Sacramento, CA. In preparation.

Fishery Foundation of California (FFC). 2004. Lower Calaveras River Chinook salmon and steelhead limiting factors analysis. First Year Report. Fair Oaks, CA. In preparation.

Koscho C. 1995 Nov 7. Calaveras River teeming with salmon. Calaveras Enterprise.

Nickles J. 1995 Nov 4. Rare event for Calaveras. The Record; Sect A:1 (col 1).

Nickles J. 1995 Nov 7. Salmon get a little help from human friends. The Record.

Nickles J. 1996 March 4. Salmon call Calaveras River home again. The Record; Sect A:6.

Nickles J. 1998 October 17. Salmon making run at Calaveras. The Record; Sect A:1.

Nickles J. 1998 November 3. Go Fish! New ladder helps salmon make it. The Record.

United States Fish and Wildlife Service (USFWS). 1989. Letter from W. White to the District Engineer of Sacramento District, Corps of Engineers. Regarding Corps of Engineers-Calaveras

River and Mormon Slough flood control investigation for San Joaquin and Stanislaus Counties, California. Sacramento, CA. October 26, 1989.

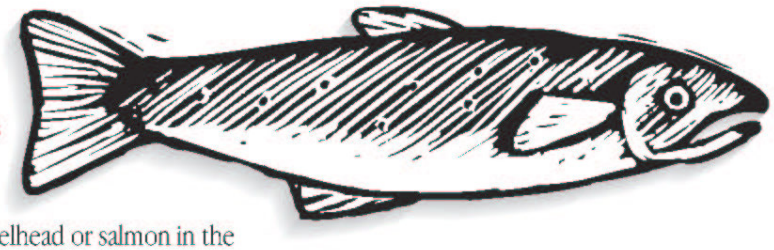
United States Fish and Wildlife Service (USFWS). 1993. Memorandum from W. S. White to David Lewis, Regional Director, Bureau of Reclamation, Sacramento, California. USBR - Stanislaus River Basin Calaveras River Conjunctive Use Water Program Study; a preliminary evaluation of fish and wildlife impacts with emphasis on water needs of the Calaveras River. January 28, 1993. Sacramento Field Office, Sacramento, California.

Appendix B
Survey Questions, Bill Insert, and Newspaper Story

Survey Questions

1. The name, address, and phone number of each respondent was recorded.
2. Respondents were asked to describe their observation.
3. Was steelhead or salmon observed?
4. Were they adults or juveniles?
5. What season of the year, or specific month, if known, was the observation?
6. What were conditions like at the time (weather, temperature, vegetation, seasonal activities occurring)?
7. Where was the location of the observation?
8. What year was the observation? How old were you?

Can you help with this historical search?



The California Department of Water Resources is conducting a search for information on steelhead or salmon in the Calaveras River or any of its tributaries—especially before the 1940s (before New Hogan Dam was built).

Information from long-time residents (such as copies of old family photographs or newspaper articles, memories, etc.) on catching or observing these fish would be of great value to this search.

For more information

Please contact Glenda Marsh of DWR's Fish Passage Improvement Program at (916) 651-9632;
e-mail: fishpassage@water.ca.gov.

Where to send information

You may either bring or send any information you may have to:

Calaveras County Water District
Attention: **Kristin Coon**
423 East St. Charles Street
P.O. Box 846
San Andreas, California 95249

You may also contact Kristin Coon at:
phone: (209) 754-3543, extension 29;
fax: (209) 754-9620; or
e-mail: kristinc@ccwd.org
(Monday through Friday between 8 a.m. and 4 p.m.)

Calaveras Enterprise newspaper article announcing information search.

Water agencies looking for fish stories

Officials gathering old stories, photos of salmon on Calaveras River

By Craig Koscho

While salmon aren't often spotted on the Calaveras River these days, state and local officials want to find out just how many times they've visited the waterway in the past.

The Calaveras County Water District is helping the state Department of Water Resources track down any sightings, news reports or photographs of salmon fishing on the Calaveras River before the original Hogan dam was built in 1931, creating Hogan Reservoir. (The present dam was constructed in 1964.)

State officials are focusing on two species – steelhead trout, those that migrate to the ocean; and the fall run of Chinook salmon.

It's all part of a larger effort conducted in conjunction with the Stockton East Water District to make river channels more passable for the fish so they can get over the Belota Weir in San Joaquin County and spawn in the stretch of the Calaveras between there and New Hogan Dam.

"As part of that, we wanted to do some historical documentation about the salmon and steelhead run on the river," said Glenda Marsh, director of the state's fish passage improvement program.

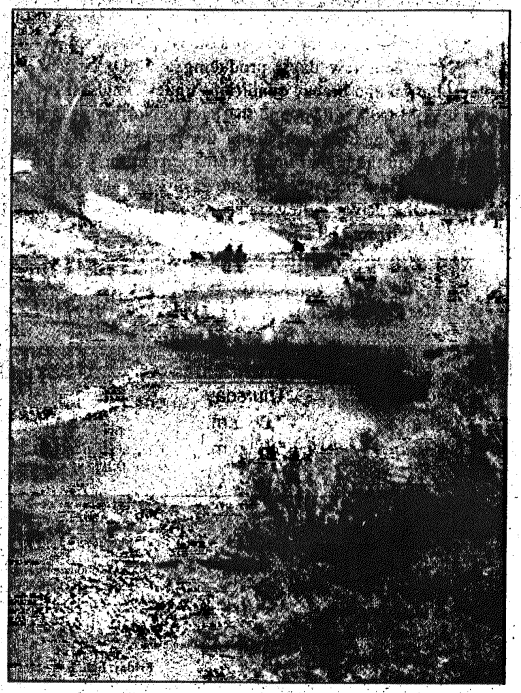
There is a lot of disagreement and debate over just how often salmon spawned in the Calaveras.

Some people say there were never any regular winter runs because the river does not have a cold enough source of water, Marsh said.

Another theory maintains that salmon that came up the river were strays attracted to the channels only because conditions just happened to be right that season.

"Salmon probably did use the river, but did they use it every year?" Marsh asked.

So state officials are looking at a time before the first dam was built, and using CCWD to help get the word out and collect information.



Enterprise photo by Craig Koscho

The Belota Weir in San Joaquin County is among the last spots where salmon were seen on the Calaveras River.

The water district sent out fliers about the study with its latest bills. By last Friday, there were already a couple of nibbles from customers, according to Kristin Coon, CCWD's administrative technician for public relations and grants.

One woman who lives in Valley Springs called to say she once saw a fisherman pull a fish out of the river as big as a man's leg, so they're assuming that was a salmon, Coon said.

Another woman said she remembered people helping salmon up the Belota Weir in 1995.

Those with photos or articles about the salmon may bring them into CCWD's main office in San Andreas. Coon said she can scan the material on the spot and give it right back to them.

The program will last as long as submissions keep coming in and until officials can draw some conclusions from them, Marsh said.

County residents with information to share may call Coon at 754-3543, ext. 29. They may also fax her at 754-9620 or send e-mail to kristinc@ccwd.org.

Marsh may be reached at (916) 651-9632 or e-mailed at fishpassage@water.ca.gov.

Calaveras Enterprise
2/5/02
re: Kristin.